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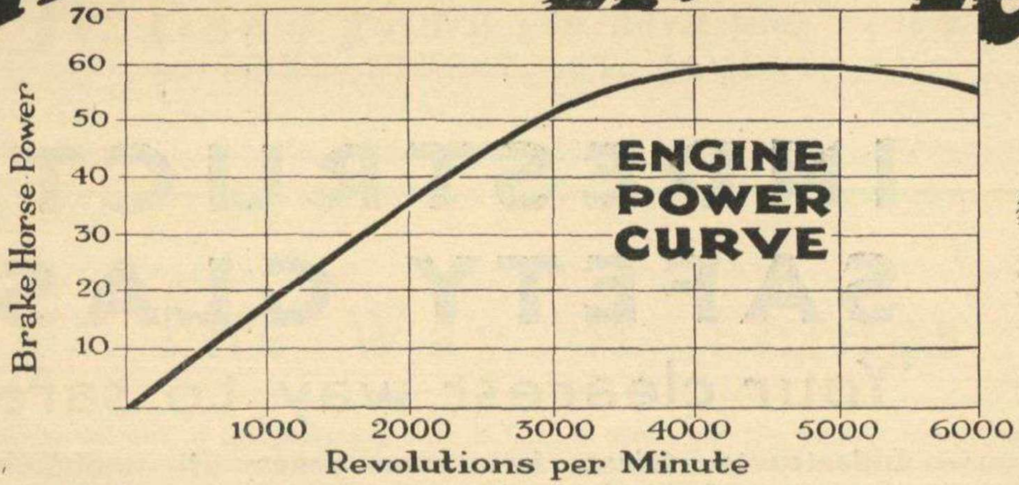

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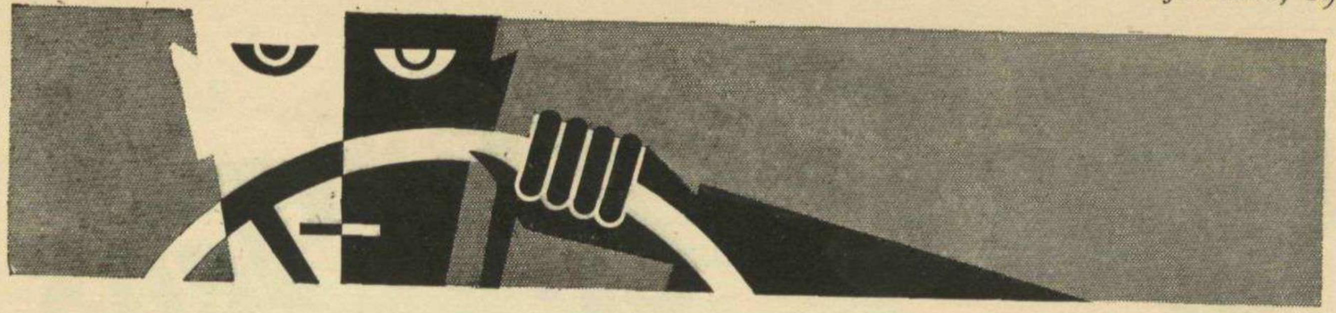

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The Way of Things

IN every sport the way of the governing body is far from being strewn with roses, and in motorcyling sport in particular many problems arise which appear almost insoluble. A case in point is the definition of an amateur, and this ever present enigma is once again brought into the limelight by the recent action of the Auto Cycle Union in suspending for varying periods, many of the riders in the 1929 Amateur T.T., as it is incorrectly but commonly termed.

The facts of the case are simple enough. Evidence was produced that many of the riders had previously accepted remuneration in the form of bonuses, from various firms; as in the definition of an amateur for the purposes of this event, this was one of the specific terms laid down as not being permissible, it does not require any great legal knowledge to see that the rules had been very definitely contravened, and the result can hardly be a surprise to anybody.

From this it may be thought that we are joining in a condemnation of the riders who have got into trouble as a result of this event, and we may as well state at once that this is not so. The error lies not so much with those who have broken the rules, but with the rules themselves. In other sports the definition of an amateur is on the whole easy, and the dividing line between amateur and professional is broad and definite. The amateur plays a game for his amusement, and the pro. for a living. Unfortunately when one comes to the mechanical sport of motorcycling such happy state does not obtain, and the dividing line becomes very hard to find.

Some time ago we were discussing this same problem with a trade rider, whose name is a household word among the followers of motorcycle road racing, and he vouchsafed the statement that he knew of only two riders whom he could really call amateurs in the strict sense of the word, and they were both men who could afford a fair amount for what they considered their chief hobby.

This remark strikes immediately at the root of the whole trouble. Motorcycle racing is not a cheap form of sport, and the average competitor is not a man of great means. The result is obvious.

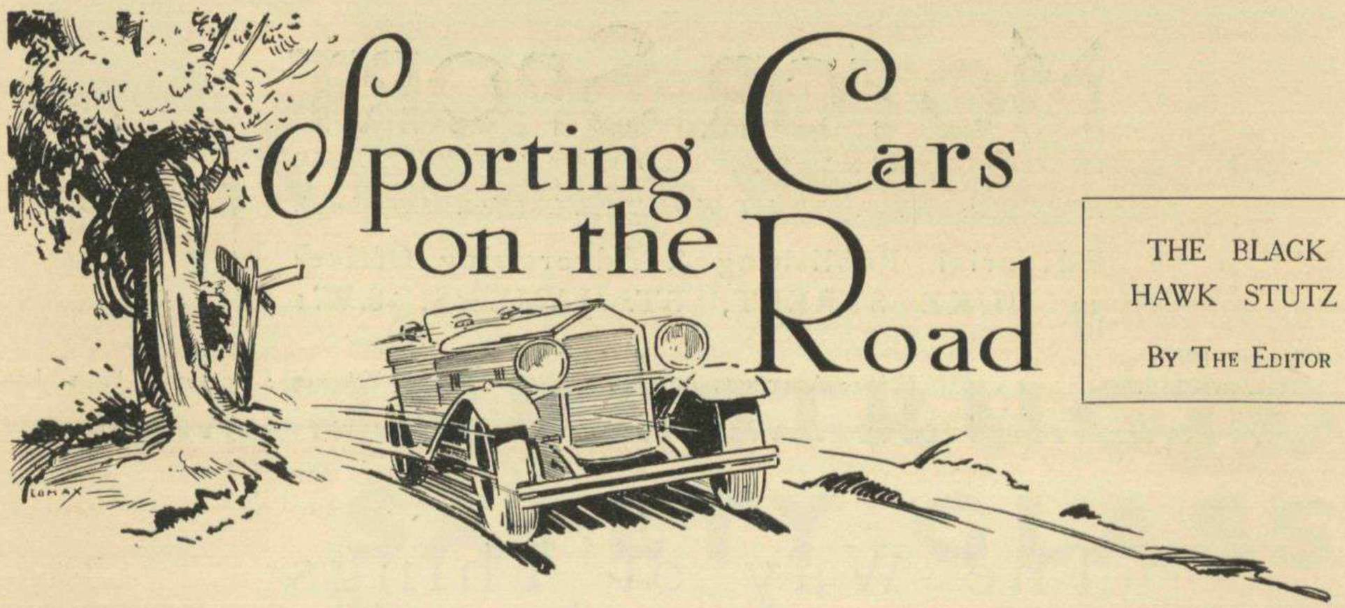
The only reason in most cases for a man to remain a genuine amateur is that he is not good enough to be able to make any money at the game.

The old division between a sport or a living no longer holds good. The "shamateur" as he becomes known, may earn a living as a watchmaker or a market gardener, but unless he is very successful at his trade he will not be in a position to afford an expensive hobby. But motorcycle racing is an expensive hobby. The fire is in his blood, and to give up one of the finest sports of all seems impossible. What to do? There is only one solution, the hobby must pay for itself, and then he can continue it. Hence the "shamateur."

In spirit he is undoubtedly an amateur. He races, not to make money, but for sport, yet his position can have no standing on paper. Technically he gets payment in proportion to his success, and is therefore a professional. The amount he gets is only a matter of degree and cannot effect our definition. As things now stand, there is only one honest course open to him, he must "turn trade." Those of us who have taken this course, simply because we could not afford to remain amateurs, will always regret being excluded from the greatest amateur event of all, but there is no alternative. The Amateur Road Race has lately been growing a more difficult problem, and now this race, if the rules are stricly enforced, will be confined to the wealthy, and the complete novice without knowledge or equipment, who amuses himself, terrifies his friends, and annoys the manufacturers of his machine. If the word Amateur is still to be used its meaning cannot be changed. Why not a private owner T.T.? The private owner is easier to define and perhaps the whole problem might be made simpler.

Rules once made must be enforced or they become a farce, and that much abused body the A.C.U. will, we are sure, receive the support of every motorcyclist in its recent action, but the whole position will require drastic revision before the next Amateur T.T.

Sporting Cars on the Road



THE BLACK HAWK STUTZ

By The Editor

WHEN we last had an opportunity, about eighteen months ago, of trying out the Stutz, we were amazed to find an American car which behaved in every way like the best type of sports car, as opposed to the more usual utility vehicle which comes from that country. The performance was remarkable as was the ease of handling, but there were still a few points in which it seemed to fall short of the ideal. One of the most important of these was the fact that it was fitted with an ordinary wide ratio 3-speed gear box, and although its performance on top gear was a revelation, we could only feel that, given the right sort of gear box, even this could be considerably improved.

As the latest models are now fitted with a 4-speed gear box we were anxious to see what could be done with it, and when Warwick Wright, Ltd., kindly put at our disposal the car which Mr. Watney had driven at Le Mans and in Ireland this year, we looked forward to some very pleasant motoring. We were not disappointed.

This car is fitted with a supercharger but this is not permanently connected. It is brought into operation by a lever on the dashboard and blows through a standard carburettor and induction pipe, which is sealed to balance the pressure. As the car had lately been used without the blower the pressures had not been adjusted and the pressure of the blower was greater than that in the fuel tank, and this caused starving of the fuel supply when the blower was used for more than a few seconds, and we therefore confined our attention to its performance as an unsupercharged car as it is in this form that most people would buy it.

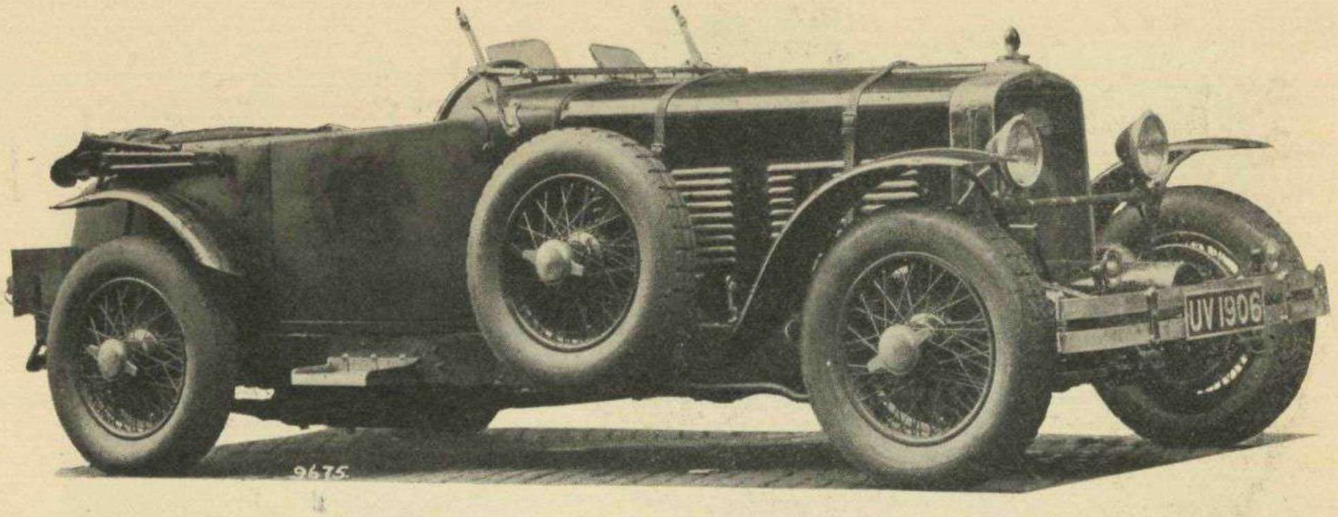
Unless the car is actually to be used for racing it is somewhat superfluous, in view of its standard performance, to improve this by supercharging. Although the acceleration using the blower is to say the least of it, very entertaining, it also is so good without it that the sweeter and smoother performance of the standard job is worth the slight sacrifice in acceleration.

One of the most remarkable features of the car, which makes itself felt from the first is the almost absurd simplicity of control. No car designed for use by the most inexperienced novice could be easier to drive than the Stutz. The gear change is so easy that it is almost impossible to miss a change, and moreover it is nearly impossible to make any noise when changing. Many cars of the large engined sports type require definite concentration if one is to drive them correctly and although the argument may be advanced that only a fairly experienced motorist will buy a car of this type, there is no reason why he should be required to use his skill to make up for poor design in the matter of gear changing.

The Stutz can actually be driven with practically no need to touch the gear lever, and will get away perfectly smoothly in top gear from a standstill. There are however many occasions when one is not in a " top-gear " mood and then one can appreciate an easily manipulated gear box. Third gear being very close to top gives amazing acceleration in the higher part of the range, and if one wishes to get by some other car *as safely* as possible, the way to do so is to pass as quickly as possible, and so avoid that horrible feeling of just getting past another car on a road which is rather narrow for comfort. On such occasions the wise man usually calls it off and has to hang behind till a suitable opportunity arises, to the detriment of his nerves and temper if he happens to be in a hurry. On a car like the Stutz, however, all that is required is a flick into third, and the other car is far behind by the time top gear is again engaged at about 70 m.p.h.

One hears such a lot nowadays about silent gears that it is a pleasure to find a car on which the term is more than a mere slogan. On several occasions when cruising along at about 50 m.p.h., we forgot we were not in top gear, and it was only a glance at the position of the gear lever that showed us we were still in third. The lower gears are just audible as are any ordinary gears on a high class car, though only as a faint hum, but third definitely cannot be distinguished from top by the ear alone. The engine has the quiet smoothness which one expects from an eight cylinder engine, and this gives a degree of flexibility which we have not known to be attained on another sports car of this size

THE BLACK HAWK STUTZ—continued.



The car tested by Motor Sport; the main windscreen can be let down flat as shown in this view.

and performance. The car we tried had been timed over the half mile at 98 m.p.h. and attained well over 90 m.p.h. on several occasions, without any fuss. The road holding at these speeds is such as to make them quite safe and the brakes give one real confidence From 40 m.p.h. the car can be brought to rest in 55ft., without locking the wheels which on a car of this size shows the efficiency of the servo mechanism.

The steering has that pleasant feeling of lightness combined with ample self centering which marks the thoroughbred, and this lightness has been attained without the steering being unduly low geared, which is not an easy state of affairs to attain on a heavy car.

The fuel system on this particular car had been modified somewhat for the events it had been entered for and there was alternative feed by pressure or autopulse, but we gather that pressure feed is not fitted in the ordinary way and this greatly simplifies the piping required.

There is certainly a growing demand for the type of sports car which combines flexibility, high speed and ample accommodation, and it would be hard to conceive a car in which these qualities are combined more cleverly and in better proportion than in the Black Hawk Stutz. It is without exception the smoothest sports car at under £2,000 which we have driven and at the same time one of the fastest. In a car of this type long runs can be undertaken without any fatigue, and the terrific power available makes long hills produce a sensation as near to flying as may be obtained without actually leaving Mother Earth.

Anything that is at the top of its class is liable to be expensive but at a chassis price of £1,250 the Stutz is really good value and we would strongly advise anyone contemplating the purchase of a high performance car around the 5-litre class, to go to Warwick Wright, Ltd., and have a run in one of these cars. They will be sure of a delightful experience, and one which they will certainly wish to repeat.

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The 11·9 h.p. Aston Martin

The latest product of a line of thoroughbreds

THE name of Aston-Martin has always been one to command respect from the connoisseur in motoring matters, and in the works at Feltham where these cars are made one soon realises why this is so. Before taking over the car which we were going to test on behalf of MOTOR SPORT we took the opportunity of examining the components in various stages of manufacture, and we would advise anyone who thinks that progress in design has given way to mass production, to visit Feltham. There he will see one instance at any rate of a firm whose one aim is to produce the best possible at all costs.

Throughout the chassis there are illustrations of the extraordinary amount of care and forethought which goes to the building of a thoroughbred motor car.

Every single piece of the chassis, from the most insignificant bolt to the chassis frames themselves are made of steel to a special specification to suit the particular job. The rear axle casing is of aluminium alloy, but to avoid carrying any of the ball races in aluminium, these are all carried in special steel housings which in turn are supported by the main bolts which hold the two halves of the axle together. The brake drums are also made of aluminium alloy bolted to a steel hub and with steel liners pressed in to take the actual wear.

The front axle is a very neat and well considered piece of work and the ample size of the bearings on the steering pivots should ensure an abnormal length of life for this part, which in many cars wears out all too soon.

The engine, which is chiefly remarkable for the unusual sloping overhead valve head for which Mr. Bertelli is responsible, gives 63 b.h.p. on the Heenan and Froude dynamometer at 4750 r.p.m. in its standard form. Every engine is balanced statically and dynamically at the works when built, so that there will never be any need for an Aston-Martin owner to consider having any work done on his car in this direction.

In a car of this type the transmission requires careful thought, for in top gear the cardan shaft will be turning round on occasions, at nearly 5,000 r.p.m., and the universal joint behind the gear box will have to be able to deal with this power at this speed without any chance of getting at all out of centre. In the Aston-Martin, the joint itself is a very neat roller bearing job and the concentricity is further looked after by ball-races immediately fore and aft of the joint.

There are many other points such as the clever arrangement for taking the torque of the front wheel brakes, the flexible oil and petrol piping, etc., but we have given enough instances to illustrate the point we have raised, that quality is the first consideration.

The first thing to impress us when driving the car was the steering, and however long one drove it, or however many cars one may have driven, this still remains an outstanding feature. It is almost incredibly light, and yet it is not " dead " like some light steering we have driven. It has a very " live " feeling which makes it easy to place the car with absolute accuracy under any conditions, and yet it is not affected by road shocks.

Many cars sprung for road-holding at high speeds are liable to be harsh when taken over freak surfaces at ordinary speeds, but in the case of this car we found that as well as being abnormally steady at high speeds even on bad surfaces, it was very good on rough stuff without altering the adjustment of the Hartfords.

A comparatively brief run on the Saturday on which we took over the car so impressed us that we decided to take it down to the West Country the next day and see how it performed over the chief hills on the Lands End course.

Our confidence in the Aston Martin was demonstrated by the fact that we were due in London for dinner the same evening, so the possibility of trouble with the car could not be considered. Accordingly the break of day saw us making our way over the winding lanes of Hertfordshire *en route* for Camberley and the main road to the West. As it was raining heavily we had an opportunity to satisfy ourselves that the hood of a sports car, can, if carefully designed, give as good protection as on a more sedate vehicle ; and further this particular specimen is definitely a " one-man " hood, which is none too common in these days of complicated weather protection.

The wet roads gave further proof of the remarkable stability on corners, and of the power of the brakes, *THE 11·9 h.p. ASTON MARTIN—continued.*

The Aston Martin at the top of Countisbury Hill.

which do not appear to lose their effectiveness whatever the road conditions. A hundred miles or so from London brought us to sunshine, and being able to see clearly the taps were turned on a bit further.

The car will hold 70-75 m.p.h. indefinitely with plenty of throttle left and will reach 80 m.p.h. from rest in a little over half a minute without excessive revving in the gears.

A very large revolution counter was fitted in place of a speedometer, and the maximum speed according to this was 84 m.p.h. This was attained in both directions so that it may be taken as fairly correct as the surface, being as nearly perfect as we know, would make wheel-spin negligible and the speed was held steadily for some distance. More interesting however than its maximum speed, which is remarkable for a standard unsupercharged 1500 c.c. engine, is the astonishing average speed which can be achieved with absolute safety. The gear ratios, which are 12.18, 7.58, 5.57 and 4.75 to 1, have a lot to do with this, as have the brakes which are as good as any we have used. They are direct operating with very accessible adjustment, are light to operate without a sign of fierceness, and will bring the car from 40 m.p.h. to rest in 51ft. on dry tarmac.

Travelling by way of Frome and Glastonbury to Porlock we ascended the hill, naturally without difficulty. However although Porlock has long since ceased to be regarded a serious obstacle the fact remains that it is definitely a useful climb, and many cars arrive at the top ready to make tea, while the Aston Martin only showed an increase of five degrees centrigrade on the normal running temperature, although the radiator was partially blanked off. And far from being ready for tea we were in excellent time for lunch! On the lower part of the hill between the hairpins a touch of throttle was sufficient to maintain 3500 r.p.m. or more in bottom gear, and it would, we are sure, be possible to take second gear between the bends. As no time would be saved we did not attempt to do so, though of course we did not remain in low after the chief corners were passed. After passing through Lynmouth and up Lynton Hill we made a short detour to see if a 12 to 1 low gear was sufficient for Beggars Roost. The hill itself was in a very bad state after the recent heavy weather but this did not worry the A.M. which pulled steadily over the "pimple" without a falter, and romped up the remainder of the climb, as if to say, "What about a little real hill climbing for a change?"

In memory of the days when hills really mattered, we dropped into Parracombe village and from a standing start at the bottom of the 1 in 5 hill out of it, we reached 4500 r.p.m. in bottom before changing into second and attained 4000 r.p.m. in this gear before the top of the hill.

The road from here to Taunton gave further demonstration of the wonderful cornering of this car. The weight distribution fore and aft appears to be ideal, as when taking a long bend at its limit control is perfect, and when the skidding point is reached the tail goes, which is as it should be. It does not tend however to swing round and overslide, and correction is practically automatic, and although an occasional squeal from the rear tyres may proclaim that centrifugal force is doing its best, there is no tail-wagging and the whole operation is perfectly smooth. At the same time if, on a sharp corner, it is required to skid intentionally, a touch on the throttle in the appropriate gear will bring the tail round to the required extent, and the skid can be stopped, as and when wanted, with perfect ease.

The central gear change has a very short lever which as the gear box is a separate unit comes directly under the left hand. The gear change owing to the extreme closeness of the ratios is very quick, and when changing down, especially to third, only the gentlest touch on the accelerator is required or the revs will be increased too much. However once the gaps between the ratios have been ascertained perfectly silent changes can be made and the gearbox becomes a delight to use. Naturally on a car of this type considerable use of the gear box is required to get the best out of it, but it must not be imagined that top gear is no good at low speeds. The top gear performance provided that the ignition control is used intelligently, is remarkably good, and throughout the whole of its range the engine is so smooth and free from any vibration, that it is sometimes hard to believe it is only a four cylinder unit.

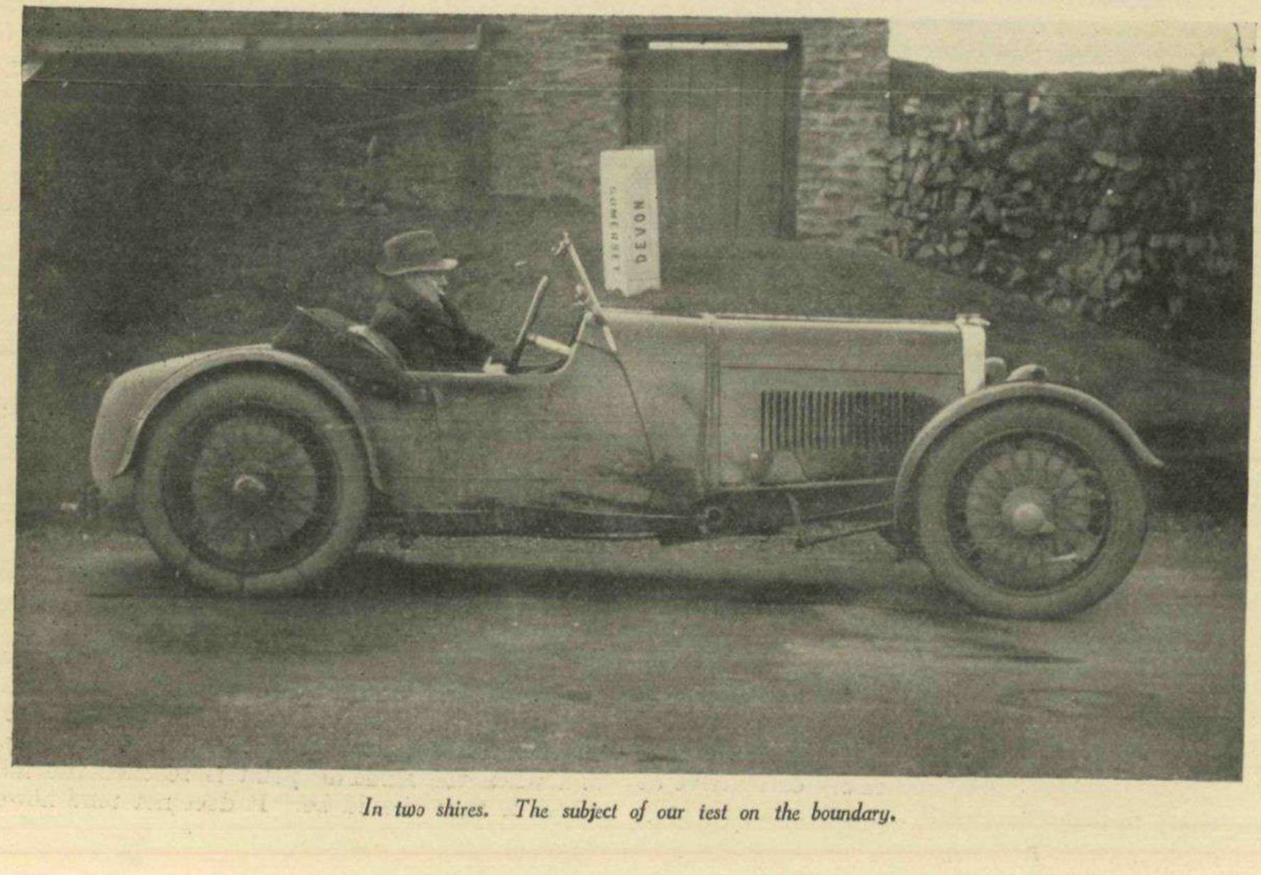
A detour over narrow lanes, made necessary by the floods, gave us a further test, and the car proved as at home in deep mud as anywhere else, and by taking to the worst of it got past a cavalcade of vehicles which looked like remaining there for the night, and so once more towards London.

By this time we had a chance of testing the Craftsman headlamps, and found that they were fully in keeping with the rest of the car. The effect was just as if a rectangular block of daylight were preceding the car, and this made it absolutely safe to maintain a good speed at night. A good point of these lamps is the fact that each has a fine adjustment for the tilt of the lamp, operated by a wing nut on the back, and the beam can be adjusted accurately instead of by the usual crude method of slacking off a nut and pushing the lamp about by hand.

Duly to time we arrived in London for dinner, and later gently pottered the odd 20 miles home, feeling quite fresh after over 400 miles in the day, under almost every known condition of rain, sun, main roads, mud, and rocky tracks. During the whole of our test we never opened the tool kit nor even the bonnet, and in spite of the continuous hard driving, the petrol consumption worked out at approximately 25 miles per gallon.

The car we used was anything but new, having many thousands of miles of hard work to its credit in the hands of many drivers, and in spite of this there was no detectable wear in any part of the chassis, and there was never a sound from the body even under the most violent treatment.

£598 may sound at first a lot for a 1½-litre car, but we think that anyone who has driven the Aston Martin and examined its construction will agree that in this case it is more than worth it.



In two shires. The subject of our test on the boundary.

SAND RACING

A branch of the Sport which is gaining increasing popularity.

The start of a car event at Southport.

EVER since the day that speed events on public roads were banned, there has been a lack of opportunities for the genuine speed merchant. There have been plenty of sporting events of the "freak" variety such as Post Hill, and the Lancashire "Grand National," but these are in a separate category.

Brooklands is available only to comparatively few who either spend their whole time there on experimental work, or live near enough to make it worth while joining as private owners.

These facts explain why in the last few years sand racing has come to the fore and now holds a position of popularity almost unequalled in any other branch of the sport, and this is largely due to the enthusiasm of clubs like the Southport M.C. whose meetings are some of the brightest features of the racing season.

Sand has many advantages as a medium for speed work, not the least being the remarkable amount of space available which requires little or no work to keep it in order, and another being the fact that really high speeds are possible.

There is no getting away from the fact that this gives it a real standing among motoring events, and helps to attract entries and spectators. When someone wants to know at what speed a certain event was won, it is trying for an enthusiastic supporter of a club to have to explain that such a speed although it sounds low was really very good "under the circumstances." With sand racing no such thing is necessary and the bald statement that in many sprint events speeds of over 100 m.p.h. are attained on cars and motorcycles is sufficient to assure the most sceptical that this is real racing. Also those whose tastes lie in the direction of long distance work have ample scope in the long races which are run at these meetings, and have an opportunity of practising road conditions coupled with high speed.

It is well known, that although Brooklands stars have been known to do great things in the I.O.M., such as F. G. Hicks, it is rather exceptional and the majority find that track racing is of little help as a training for road racing.

Furthermore those who have done well in the various miniature T.T.'S held in private grounds in various parts of the country do not always shine in the greatest road race of all. This, I am inclined to think, is because they have not got used to the really high speeds necessary, and although they are often very neat on the slow corners, they cannot cope with the all out corners which comprise such a large part of the I.O.M. course. It is on the fast bends that the race is won, and on which the stars show up to such advantage. Long distance sand races produce many of the conditions of a fast road race in that braking from really high speeds is such an important point, and some of the fast continental road races, with their long straights and few corners, are not so very unlike them.

Southport has provided P. Hunt among others to show that this is useful training, while the Amateur T.T. entries are very largely supplied from this part of the world. Many other districts have followed suit and Saltburn and Skegness provide events in the season which give plenty of opportunity for tuners to show what they can do, and all who have been down to Pendine for the Welsh T.T., will agree that this is one of the cheeriest and most informal meetings of the year, and one which they will not miss if they can help it.

In view of these remarks it might be imagined that the beach is the world's finest racing track, and it will therefore be as well to consider its disadvantages and consider what steps can be taken to minim se them. The first and most obvious complaint, especially from the private owner, is that the wear and tear on the

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SAND RACING—continued.

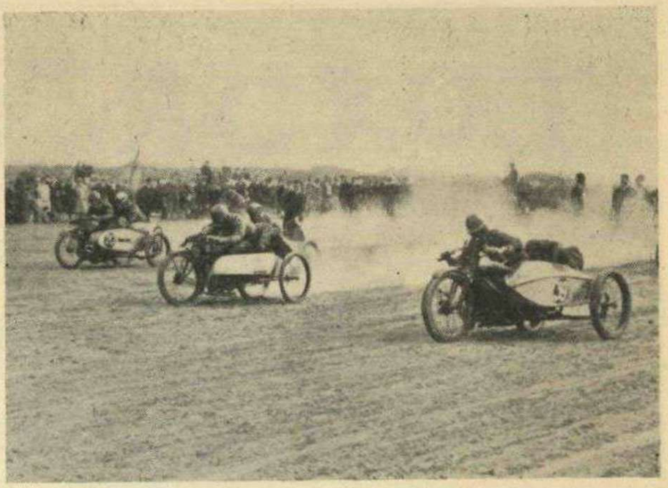
machine is apt to be heavy, owing to the sand not staying on the beach but getting into vital portions of the mechanism.

On taking down an engine after a sand meeting I have found sand in the crankcase to quite an appreciable extent, which does not help to prolong the life of the bearings or cylinders.

In the case of a car the engine is fairly well protected, but a motorcycle needs considerable attention if it is to avoid damage to the working parts.

However here a page can be taken from the book of the dirt track rider, and if wire gauze is employed in a sensible manner it is possible without sacrificing neatness to cover the valve gear, tappets, etc., so as to avoid trouble from this source.

A further source of much trouble is the water flung up by the wheels, and also by other machines, and as sea water is far more harmful that fresh, special care must be taken with the magnet . Oiled silk is one of the best mediums for protecting this component, and this again can be neatly applied. An important point to notice is the opening from the magneto chain case in many machines, and though many riders, with plasticine and other engineering commodities, protect the contact breaker end of the magneto, they are liable to omit the very vulnerable point mentioned above.

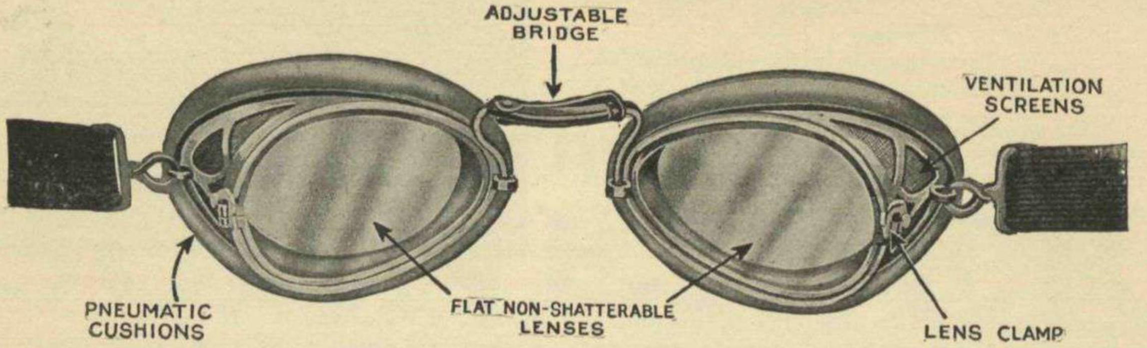


On a motorcycle the chains always have rather a rough time, and unless they are totally enclosed there is little that can be done for them in actual running except to lubricate them. A steady feed of oil is better than grease as it tends to wash any grit off the chains instead of collecting it. If the chains are removed and washed thoroughly between each meeting and the sprockets carefully cleaned, the wear is not excessive. If gauze is used on the air intake it is necessary to make up a gauze box to provide a good area, or there will be a danger of restricting the air flow and consequently the speed. Wheel bearings are now greatly improved and if looked after in a normal manner will not wear unduly, but of course if they once get dry of grease the spray will certainly corrode them very soon.

In short it is a form of racing which can be indulged in by the private owner with the minimum of expense, in view of the excellent sport provided ; and every season sees an increase in the number of competitors on two, three, or four wheels, at every beach meeting.

(Top) Sidecar races are always a popular feature. *(Above) Massed starts make a fine spectacle.*

LUXOR GOGGLES



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The 2-litre Schneider.

A fast run on a well tried car.

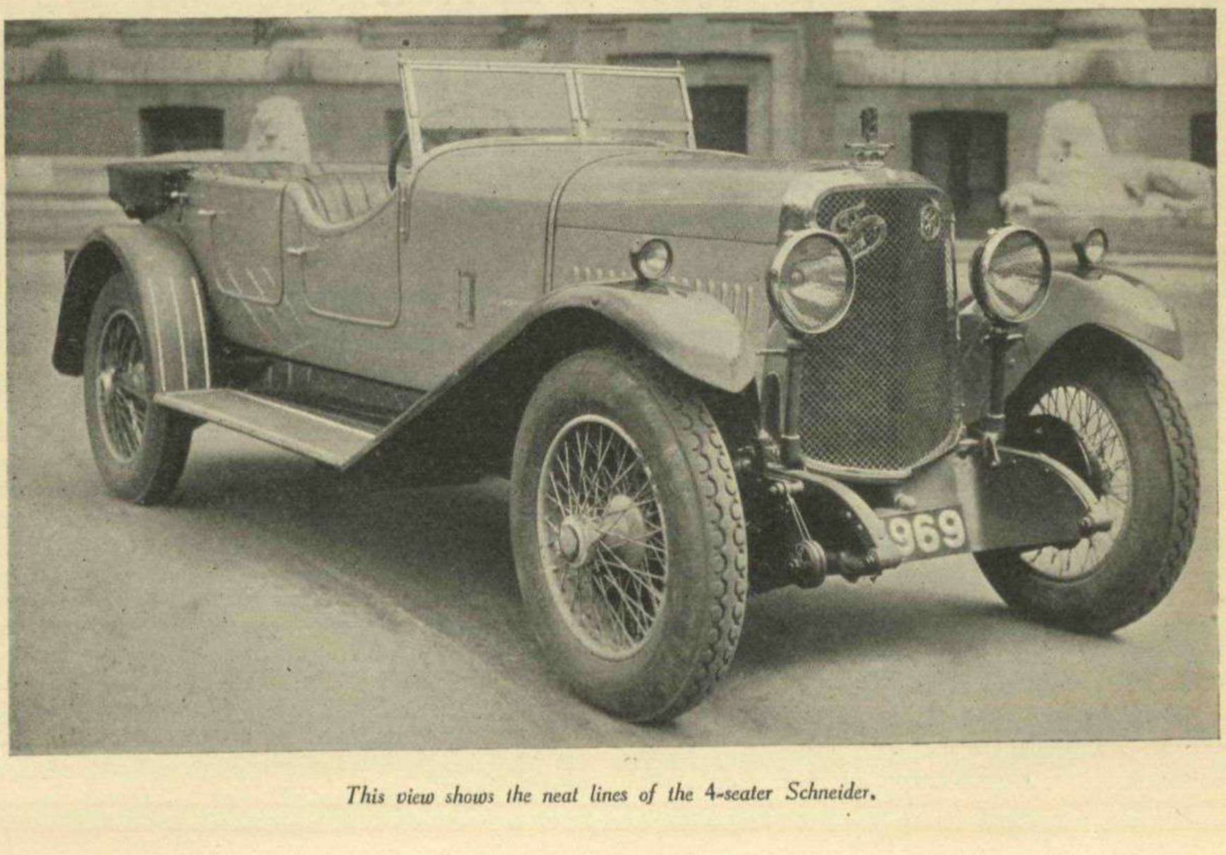
THERE are a great many people who are frightened to buy a sports car on the grounds that any high speed machinery is bound to wear out quickly and as they cannot afford continual replacements, they stick to a touring car. The other view is that as a sports car has to be capable of giving a high performance it must be strongly built and such a car should give better service over a long period than a touring car driven at its limit all the time.

The latter view is the one we have always held and we were therefore interested in the idea of taking out a Schneider saloon which was offered to us for a day's run to the Midlands, as this particular car had already seen 50,000 miles of service.

Taking a completely strange car over in the midst of London traffic, does not give much chance to get used to the controls, and it is therefore hardly surprising that we were taken unawares by the astonishing power of the brakes. In fact the first time we somewhat thoughtlessly applied them we nearly went through the windscreen, and felt extremely glad that no other vehicle was following immediately behind. Once in the open, and moving at a reasonable speed, the brakes were quite efficient, and though only a light pressure was required to operate them, they were not really fierce. However at low speeds we must confess that they did not come up to our idea of sensitiveness, and were too liable to come on fully whether we wanted to brake hard or not.

It may not be fair to criticise a car of this date, when the latest models have been improved in many ways, but we like to speak of things as we find them, and we will therefore deal with the few points on this car which we did not like before going on to tell of those features which we did, which as there are more of them, will take longer.

The car we were driving had an altered gear change lever as it had been lengthened considerably. We would personally have preferred the standard short lever as with the long lever, when changing from second to third gear, the left wrist is brought sharply into contact with the rim of the steering wheel, which by the end of the day made the said wrist quite sore! A small point it is true, but these little things are liable to cause evil language before long. The present model differs in points of detail from this chassis, which was two years old, and the new car has a light plate clutch and improved gear change, which is certainly a good point, as we found the gear change rather heavy. The heavy cone clutch took some time to slow down, and in consequence upward gear changes were rather slow.



This view shows the neat lines of the 4-seater Schneider.

THE 2-LITRE SCHNEIDER—continued.

As we were in a hurry, we did not spare the engine once we were clear of town, and continuous full throttle in all gears was the order of the day. This appeared to have absolutely no effect on the performance of the engine except that when well warmed up it went rather better than at the start. We cannot honestly call this a fast car, but as it was fitted with a fairly heavy saloon body, a maximum speed of just on 70 m.p.h. is by no means bad going for a 2-litre engine.

The speedometer needle went round to 70 m.p.h. very quickly, but we somehow could not and still do not believe that this represented more than an actual 65 m.p.h. It was only on " waiting for it " a bit longer and getting the needle a little further round that we really felt we could give the actual speed at 70 m.p.h. This suspicion was later checked by comparing our cruising speed with the milestones and our watch.

The four speed gearbox enables a very fair average to be maintained, as third is usefully high, and simply asks to be used. The engine gave us the feeling the whole time that no amount of full bore on indirect gears would ever break anything, and although the only engine overhauls besides decarbonising had been to change to a different type of piston, earlier in its life, there was practically no mechanical noise at any speed, This is a wonderful tribute to the lubrication system. and shows that the bearing sizes must be very adequate indeed.

The acceleration was of course somewhat reduced by the weight of the saloon body which made the car feel slightly overgeared. Once a good cruising speed had been attained hills made little difference, as it would take main road hills faster in third than most cars in top gear, and there is no point in a close ratio gear box unless it is used consistently.

Steering is quite accurate and self-centering, if anything, too much so, as it is rather on the heavy side as a result. The gear box was quiet in all gears in spite of a big mileage, though first gear was only used on one or two occasions when manœuvring the car, as normally second gear was used for starting, and judging from its performance in this gear it would be a very tough proposition in the way of gradients that would require the lowest ratio. The feeling of strength about the engine was manifest throughout the whole car, and we feel sure that anyone purchasing a 13-55 h.p. Schneider will have his work cut out to wear it out !

A COACH-LIMOUSINE.

The Big Car of the Future?

WE are still apt to look upon the motor-coach and the private car as being entirely different. In point of fact the former is but a private car writ large. As regards performance and refinement there is little to choose between them ; while in the matter of price there is an enormous difference, for even large coaches cost very much less than a big private car.

In the days when enormous top-heavy chars-a-banc were one of the major terrors of the road it was considered somewhat *infra dig.* even to be seen travelling in one ; no one in his senses would have bought such a vehicle for private use.

Yet with the vast changes that have come about in the last year or two, why should not a private owner have a coach, instead of an ordinary limousine ?

Take a Commer passenger vehicle, the " Invader " Type 6-TK, for instance. For less than £1,000 one can buy a coach complete that is three or four times as roomy as the largest car on the market, every whit as comfortable and very nearly as speedy as those costing £1,500 or £2,000 for the chassis alone.

For example, it has a four-speed gear-box with silent third ratio, a refinement still lacking on many makes of private car. It is capable, too, of high speeds with great safety. Few large chauffeur-driven limousines have a better performance. And lastly—an important point—the controls and the steering are as light and as easy as they are on a baby car.

What could one *not* do with the enormous body space available ? The " occasional " seats which figure on even the most expensive cars would in this coach-limousine become luxurious settees. References to " leg-room " of which so much is made in descriptions of ordinary cars would cease to have any meaning ; promenade room would be a more accurate term.

And then again there would be such scope for individual taste. The business man could have an elaborately equipped office on wheels. The holidaymaker could convert the saloon into an extremely comfortable and roomy bed-sitting room, and could make his coach far more comfortable than the best caravan, with the added advantage that there would be no trailer to make driving more difficult.

In short, there would be room for any sort of equipment, and the total cost would be less than that of a high-class limousine. Running costs, too, would compare very favourably with those of a very high-powered seven-seater.

Modern Welding

By C. W. BRETT

(Managing Director of Barimar Ltd.)

THERE was a time, and it was not very long ago, when welding was regarded as a sort of glorified soldering, or as a process about as efficient as brazing. This view, which was commonly held by a large number of capable engineers and others, may be accounted for by the fact that a large amount of repair and reconstruction work was undertaken by ordinary engineers or mechanics, as a sort of side line or adjunct to their regular work. There was, however, another reason which, if it did not create, at least kept alive the prejudice, and that was the actual and undeniable limitations of the process itself.

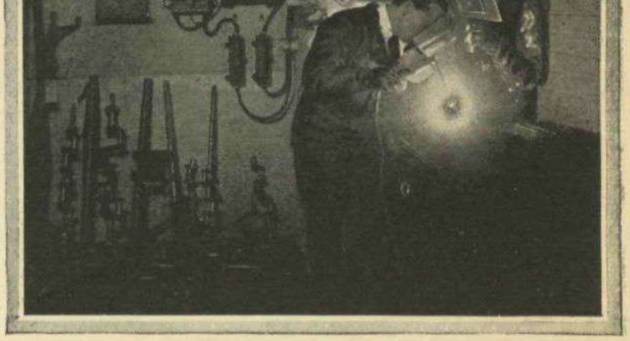
In the last two decades all this has been changed ; in place of the tyro or occasional welder fiddling about with a wholly inadequate equipment and attempting the (then) impossible, we have the specialist. In place of one or two undeveloped and unreliable fusive processes, we have now six distinct fusive agents which have been brought to a wonderful pitch of perfection by endless research, investigation and experimentation by metallurgists and scientists all over the world.

As a result, the popularization and utilization of welding has increased to a truly remarkable extent, and the former prejudice, if not yet dead, " is doomed and doubly damned." As a well-known engineer said recently before an audience of technicians : " If a weld fails, under normal load strain, the failure is due to the deficiency of the operator, never of the process. A scientifically welded member or component should in all circumstances function as efficiently as a new member of similar dimensions and material." The man who declares that " you can't expect more than 75% efficiency from a welded part " is either woefully ignorant of modern welding practice and its potentialities, or he himself is inexcusably lacking in skill and experience. The only alternative is that he is attempting metallic recreation or mechanical reconstruction work with insufficient material equipment or by the application of a fusive agent unsuited to the particular metal or machine with which he is dealing.

Welding to-day implies (a) the direction of an expert whose knowledge of metallurgy and thermics enables to select the process from which, in any given circumstances, the best results may be anticipated, and to supervise and control the application, (b) the services of an operator of skill and experience in handling each and all of the industrial metals by any of the fusive processes which nowadays constitute the specialist's equipment, and (c) the possession of the most up to-date apparatus and appliances used for high temperature treatment. Without these minimum essentials all welding becomes a pure farce if not an impossibility. It is as reasonable to expect an apothecary's assistant, armed with one prescription, to cure all human ills, as it would be to expect a journeyman engineer equipped with a one-process welding set to tackle the complete reconstruction of plant and machinery of all descriptions. In the former case the death of the patient is inevitable, in the latter the destruction of the machine or component is a foregone conclusion.

From the modern viewpoint the facts are these : Scientific welding can be readily and rapidly employed to effect the partial or total restoration to 100% efficiency of mechanical devices of every description and size, used for whatsoever purpose, and fabricated of each or all of the industrial metals, including high speed steels. It can be relied upon to effect a cash saving of from 50% to 90% on the cost of replacement, and a proportionate saving in time. It is not merely capable of restoring a unit or component to its former efficiency, but can be used to increase strength or dimensions to any required degree, to make good fractures, wear and tear or other damage, to eliminate design or material weaknesses, and to maintain units or components at " peak performance " pitch.

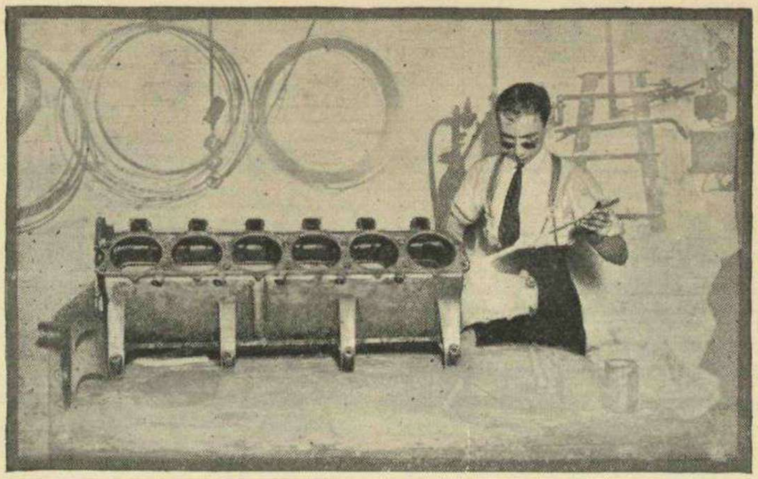
It would be manifestly absurd, in speaking to readers of MOTOR SPORT to attempt to disguise the many problems and dangers attendant upon the submission of high grade metals to temperatures ranging between 1200 and 5500 degs. F. The difficulties by which the welder is confronted at every stage of the work are increased a hundredfold when the work relates to the welding of steels containing varying proportions or combinations of zirconium, tungsten, nickel, chromium, molybdenum, titanium, vanadium, manganese, etc., etc. Indeed, in such cases, the slightest miscalculation or mishandling will almost assuredly result in robbing the metals treated of those particular and peculiar qualities they were expressly intended to embody, and in



An electric arc welder at work.

MODERN WELDING—continued.

reducing their efficiency to nil. Many serious accidents, involving heavy material loss and possibly loss of life, have been caused in this way.



A crankcase being repaired by welding.

It is sometimes said by those unfamiliar with modern achievement that welding is only suitable for certain classes of work or certain metals. This is quite erroneous. A specialist should be able to tackle practically any machine or any industrial metal under a definite "money back" guarantee. This point is worthy of special note because it is the hall mark of the acknowledged expert. Refusal to work under these terms practically amounts to a confession of incompetence. If a welder states that he is a specialist it is not unreasonable to expect him to justify his claim by sound performance ; on the other hand, it is not unfair to refuse to accept the credentials of an operator who seeks to evade a perfectly legitimate challenge.

The value of scientific welding to the motorist may be gauged by the following incomplete list of repairs and reconstructions which are now regarded by the specialist as ordinary routine jobs.

Fractured, scored, worn or damaged cylinders (without enlarging the bore or fitting new pistons) combustion heads, water jackets, crank cases, cranks, cam shafts, transmission shafts, gear boxes, gears, axle shafts, axles, hubs, wheels, radiators, chassis frames and members, light metal sections, mudguards, lamps and all garage tools and accessories. Actually there is scarcely a metal part from the radiator cap to the luggage grid which, in the hands of a skilled operator, cannot be reconstructed equal to new. The age, make, size or condition of the unit or component is immaterial ; the only thing that does matter is the selection and proper use of the fusive process best suited to the material and the job in question.

In America, Germany, France, Belgium, and, indeed, in most manufacturing countries scientific welding is being increasingly used for the reconstruction of plant and machinery of every description used in all trades and for all purposes, and also in the fabrication of metal devices of all kinds, many of which are called upon to withstand exceptionally heavy stresses and strains suddenly imposed.

That welding has now reached a pitch of perfection which admits of no debate is proved conclusively by existing statistics showing that the breaking strain of a welded member is not less than that of the original part, but, in conjunction with this statement, it must not be forgotten that high efficiency demands the services of the highly efficient.

Any fool can weld ; but the welding of any fool is about as reliable as " a cat in a pantry."

FLYING IN THE GALE.

DURING the height of the stormy weather of last month, one of the new Desoutter air taxis belonging to National Flying Services had an opportunity of displaying its ability to get through really rough weather. When the country was swept by a 50 mile-an-hour gale, with low clouds and frequent storms of rain, it was flown by Flight Lieut. A. J. Styran from the London Air Park, Hanworth, to Manchester and Liverpool, returning on the following day to London.

The object of the journey was to demonstrate the Desoutter to certain prospective purchasers in the north, and no more convincing demonstration could have been given of the all-round qualities of the machine than that it actually arrived under such conditions, the two occupants being very pleased with their experience and perfectly dry.

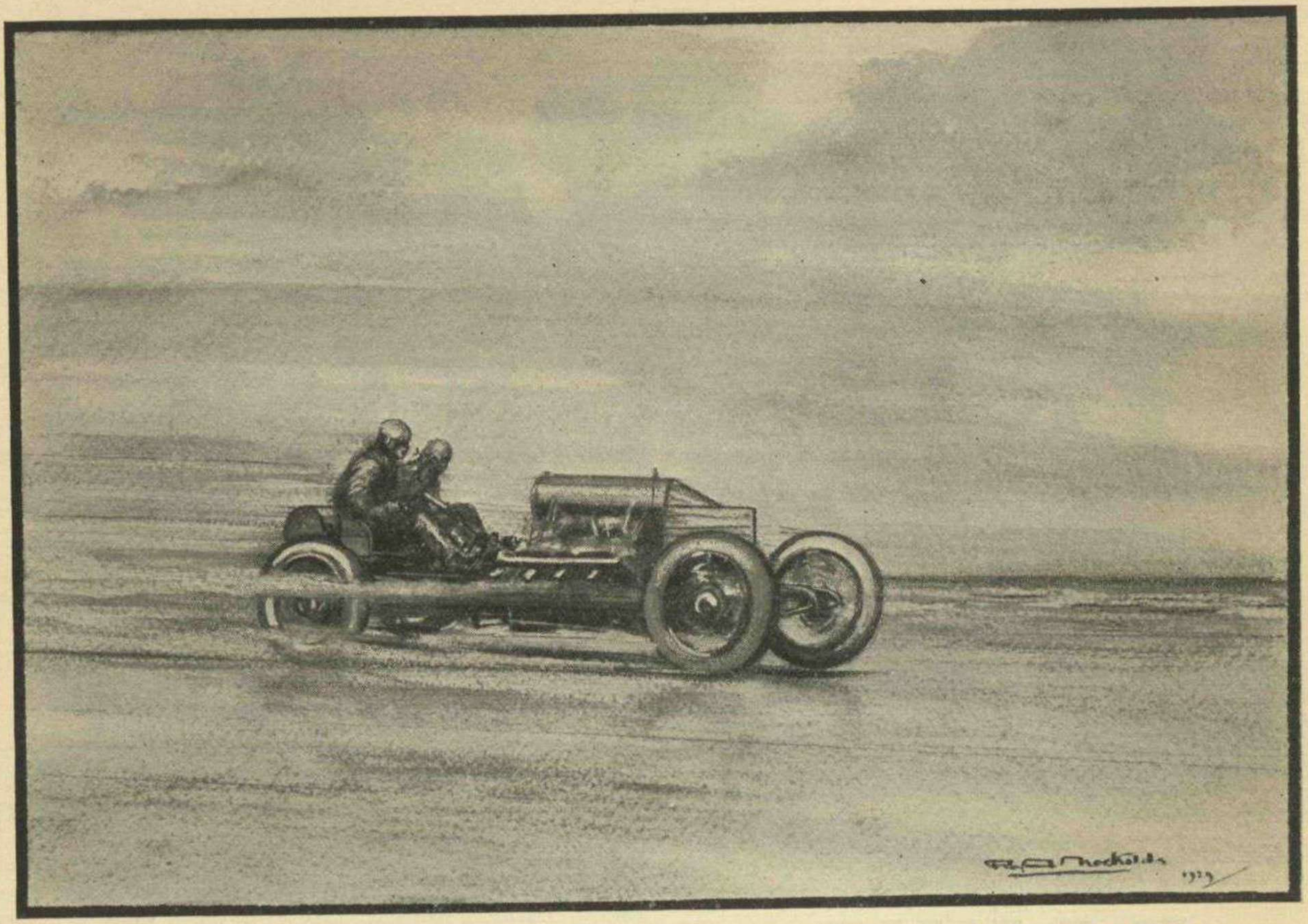
Both the pilot and the passenger, Mr. W. D. T. Gairdner, were immensely impressed by the steadiness of the machine in a violently bumpy wind, and the comfort of flying through torrents of rain in an enclosed cabin.

The wind and wet would have been distinctly unpleasant in the conventional type of light aeroplane !

On the homeward journey, when flying against the weather, the high cruising speed of the machine was particularly valuable. An air speed of about 95 miles an hour was maintained throughout the flight.

Great Racing Marques:—The Darracq.

By E. K. H. KARSLAKE.



The famous 200-h.p. Darracq on which Sir Algernon Lee Guinness exceeded 121 m.p.h. on Saltburn Sands in 1908.

WHILE in other countries cars are frequently called either by fancy names or by initials, it is noticeable that almost all French cars are called after the man who started to build them. On the other hand, it is curious to note that at the present time there is one exception to this rule in the form of a car which has lost original name in its native France while still retaining it in England ; for while it is still known as the Darracq in England, the car has only to cross the channel to become a Talbot. Its name, in fact, has varied from time to time ; but it has been consistent in demonstrating that a good car by any other than its original name can run as fast.

In the early days of this century, M. Darracq had already begun to make cars, and it was not long before he saw that the road to fame lay through racing. In 1902 the French Government, desirous of proving that home-grown alcohol was an efficient substitute for petrol, decided to do so by organising a long-distance race for cars running exclusively on the former fuel. The course chosen was 572 miles in length round the Nord province, starting from Champigny and going by St. Quentin to Arras, where a stop was made for the night ; and the next day returning by Boulogne, Dieppe and Rouen to St. Germain.

There were forty-six starters in the race, which included a team of Darracqs, and all the best-known French manufacturers were represented. At the start of the race Maurice Farman took the lead on one of the Panhards, but the man who soon captured second place was Marcelin on one of the Darracqs ; and when the first day's racing was finished at Arras, he was still there. The next day he held his position well, but just before the finish he was overhauled by Charles Jarrott on another Panhard, and lost second place by no more than ten seconds. The defeat, however, was something of a victory, for while the winning Panhards were both 40 h.p. machines running in the 1,000 kilo. class, the Darracq was in the smaller 650 kilo. division, which it won conclusively.

M. Darracq, in fact, was at this time one of the few people who believed in the future of the light racing car, but while his preference was ultimately to be justified, it kept him for the moment from prominence in the big races. In 1905, however, the French eliminating race for the Gordon Bennet Cup team was held over the Auvergne circuit ; and for it seven manufacturers entered teams of three cars, among them being three light racing Darracqs. The cars were indeed hardly "light" racers to modern ideas, as they had 4-cylinder

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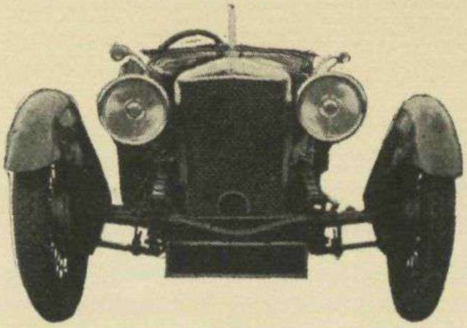

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GREAT RACING MARQUES—continued.

engines of 150 × 140 mms. bore and stroke (9,880 c.c.), but their weight was considerably below that of their rivals, as they only weighed some 15 cwt. In spite of this, however, the Darracqs soon showed themselves to be among the fastest cars on the course, and in the end Wagner's machine only missed third place and a place in the French team for the cup by a few seconds; while the three cars all finished the course, only one other team achieving a like honour.

As a result of this narrow defeat, M. Darracq challenged the winner of the cup to a private race with Wagner's 80 h.p. Darracq; this, however, could not be arranged, but a month later he had his revenge. In 1905 the third Circuit des Ardennes Race was run over the famous Belgian course, the distance being 370 miles. For this race a team of 80 h.p. Darracqs were entered, and on one of them Victor Héméry succeeded in getting home first, having averaged 62 m.p.h., which was a record for the race.

From Belgium the scene was moved to Italy, where in 1905 the second Florio Cup race was run over a circuit near Brescia; and in it Wagner and Héméry started on their Darracqs. In the early part of the race Héméry got into the lead, but finally he had to be content with fourth place, while Wagner finished eighth.

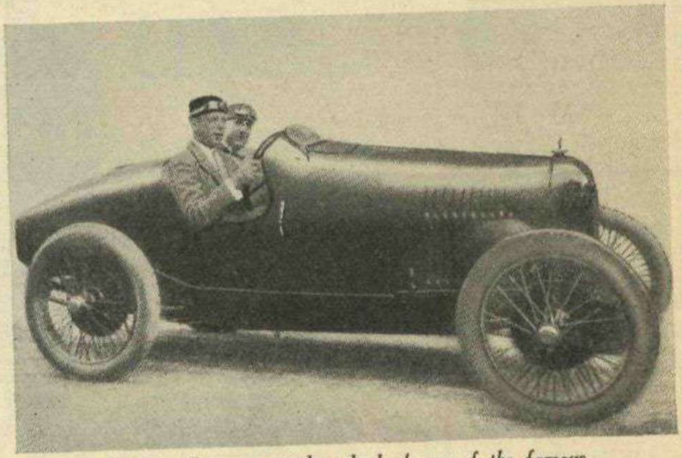
At this time, however, M. Darracq had no intention of confining his attentions to Europe, and after the race the team was shipped to America and entered for the second Vanderbilt Cup race, which was run over the Florida course of 283 miles. Héméry, after the Circuit des Ardennes, seemed to have acquired a habit of victory, and once more he seized first place in one of the most important races of the year, averaging 61.6 m.p.h. The race took place in October, and in February, 1906, a race was held in Cuba over a 218 miles course. The Darracqs were entered for this event also, and once more came home in their accustomed place; this time, however, the winner was Demogeot, who averaged 59.9 m.p.h.

The great event of the 1906 season was of course the French Grand Prix, which was run at le Mans. Three Darracqs were entered for it, and had Héméry, Wagner and Hanriot as their drivers. The cars were of a nominal 125 h.p., and had 4-cylinder engines of 180 × 150 mms. bore and stroke (15,270 c.c.), with low-tension magnetos; while transmission was by a 3-speed gear box and a propeller shaft. In the race, however, they were not fortunate, for although the cars had been tested for 5,000 miles, they all three were put out by broken valves, Héméry being the only member of the team to complete the first of the two days' racing, occupying tenth place.

Once more, however, the Darracqs were to prove more successful abroad than at home, and in 1906 a team was again entered for the Vanderbilt Cup, and again the winner was a Darracq, this time driven by Louis Wagner who averaged 61.3 m.p.h.

For the Grand Prix in 1907, the old 1,000 kilo. weight limit was abolished and instead the competing cars were limited to a fuel consumption of 30 litres to 100 kilometres. The race was run at Dieppe, and concurrently with it was run the Coupe de la Commission Sportive, which was for cars limited to a consumption of 15 litres, to 100 kilometres. In the Grand Prix, Darracq entered three cars of the same type as had run the year before, with Hanriot, Rigal and Caillois as their drivers; while two light cars driven by Demogeot and de Laughe were entered for the Coupe de la Commission Sportive.

There were 37 starters in the Grand Prix, but of these the Darracqs were almost always among the leaders. Hanriot went out on the seventh of the ten laps, but Caillois forced his way into fifth place and remained there till the finish, while his team-mate, Rigal, was sixth. In the Coupe de la Commission Sportive, however, de Laughe got the lead in the early stages and finally finished first, with Demogeot on the other Darracq third.



K. Lee Guinness at the wheel of one of the famous 200-mile Race Darracqs.

In 1905, the Darracq company constructed five racing cars of a distinctly novel type. These machines had 8-cylinders arranged in a Vee, and a 2-speed gearbox in the rear axle. One of these cars with an engine of 170 × 150 bore and stroke (27,240 c.c.) set out in the year 1905 to attack the kilometre record, with Héméry as its driver. The record actually belonged to Darracq at the time, for in 1904 Baras on a 100 h.p. Darracq had captured it at Ostend with a speed of 104.53 m.p.h. Héméry, however, with his big 200 h.p. machine, was determined to better it, and on the last day but one of 1905 he set up the average of 109.65 m.p.h.

Another of these Vee-eight engined machines with a bore and stroke of 160 × 149 mms. (24,176 c.c.) was acquired by Sir Algernon Lee Guinness and brought to England. With this car he succeeded on Saltburn sands in 1908 in covering a kilometre in one direction at 121.6 m.p.h., a truly remarkable speed to accomplish twenty years ago.

The year 1908 also gave another opportunity for Darracq enterprise, when the Russian Government organised a straightaway race from St. Petersburg to Moscow. In this Demogeot, the winner of the Cuban race in 1906, started on a Darracq, and after a magnificent race over the Russian roads, finished second.

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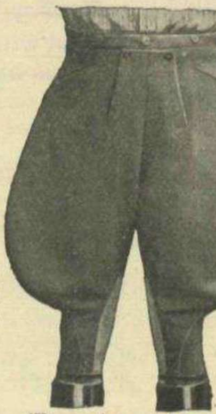

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GREAT RACING MARQUES—continued.

While these activities were engaging Darracq on the Continent, however, the cars were not absent from British racing. In 1905, the R.A.C. organised its first Tourist's Trophy race over the Isle of Man course for cars with touring bodies and with a fuel consumption limit of 22.54 m.p.g., which was supposed to be equal to 25m.p.g. on ordinary roads. For this event two Darracq cars were entered with 2-cylinder engines developing 10 h.p. at 800 r.p.m., 3-speed gearboxes, and shaft drive. The cars were driven by Sir Algernon Lee Guinness and A. Rawlinson, but neither of them succeeded in figuring very prominently in the race, as they were forced to retire on the first and second lap respectively.

The next year the race was run again on a fuel limit, this time of 25 m.p.g., and again two Darracqs started in it. This time, however, they had 4-cylinder engines of 90 × 120 mms. bore and stroke (3,044 c.c.), developing 15 h.p. at 1,500 r.p.m., and four-speed gearboxes. Lee Guinness again drove one of the cars, and the other was now entrusted to S. Girling, and this time, after a magnificent race, Guinness succeeded in finishing third.

In 1907 two Darracqs again returned to the charge, this time with the brothers Algernon and Kenelm Lee Guinness as their drivers. The latter was not lucky, however, for when he had worked into sixth place on the second round an axle-shaft broke and a back wheel came off. Algernon, however, after getting into seventh place on the first round, was sixth by the third, second on the fifth, and finally took the lead on the last round; and then only 2½ miles from the finish, his Darracq ran out of petrol and the race was lost when it seemed to be absolutely within his grasp.

In 1908 the rules for the race were entirely altered, and both limitations as to body-work and fuel consumption were done away with. Instead, the bore of 4-cylinder engines was limited to 4 inches, and it has been known ever since as the Four-Inch race. For this event three Darracqs were entered with engines of 100 × 160 mms., only two other makes daring to employ a longer stroke, and push-rod operated overhead valves. Algernon Lee Guinness again drove one of the cars, A. Rawlinson returned to the team, and the third car was driven by A. E. George. On the first lap, Rawlinson turned over at Ramsey, but nothing daunted he continued the race, while George got into first place and Guinness ran fourth. On the second lap Guinness moved up to third place, while George retained his position. By the sixth lap the two Darracqs were in the lead, but before the last lap began Guinness had dropped back to third. George, however, was still first, and then on the last lap his car caught fire, and by the time he had extinguished the flames he was only able to finish third, while Guinness was second; and thus once more Fate overtook the Darracqs in the Tourist Trophy when victory seemed certain.

[*This article will be continued in our next issue, when the history of this Marque in the post-war period will be given up to the present day.*]

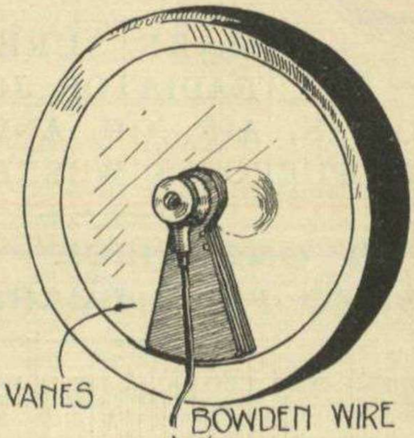
NEW ANTI-DAZZLE AND FOG DEVICE

A correspondent of "Motor Sport" writes :—

A PROBLEM associated with road transport which has received a great deal of attention from inventors in recent years is the elimination of headlight glare, and the number of anti-dazzle devices now on the market are many and varied. Frankly, some of these are far from satisfactory, but others are very effective and certainly go far in making night driving more comfortable and safer for road users generally. In the latter category must be placed a device recently demonstrated to me which besides having definite qualities in diminishing glare, is also useful in foggy weather.

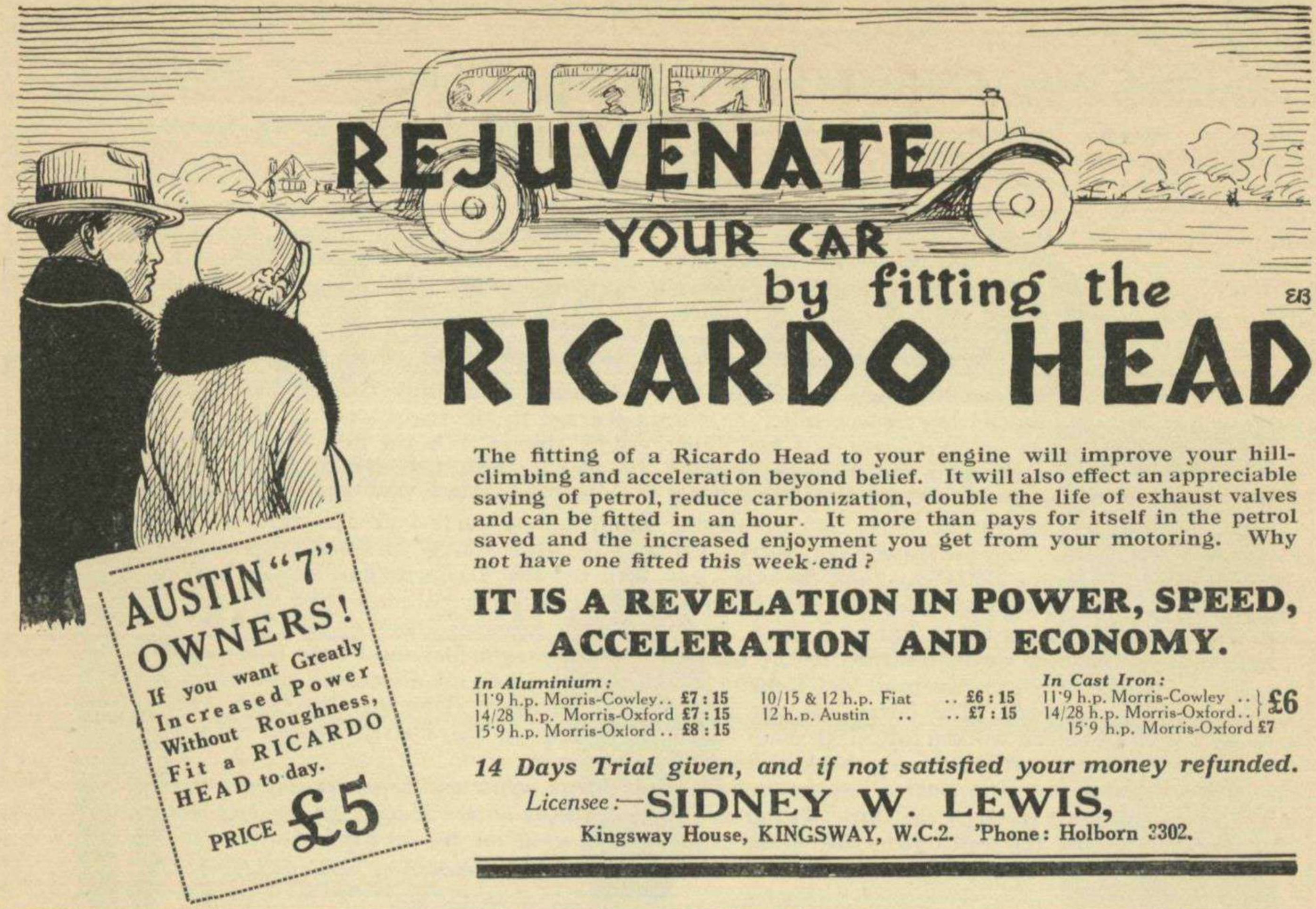
Briefly it comprises fine segments or vanes of amber-tinted mica, pinned at their apex to a spindle, the whole assembly being fixed to the lamp glass. Attached to this spindle is a coil spring, which, when the device is in the "off" position, holds the vanes, packed one over the other. When the spindle is rotated (the action being transmitted from a small hand lever on the steering wheel through a Bowden wire), the vanes are spread out and shroud the upper rays passing through the lamp lens. A further rotation of the spindle extends the vanes still further so that the entire area of the lamp lens is covered, transmitting a yellow hue to the beams for driving in fog.

Practical tests under varying conditions have proved the device to be thoroughly satisfactory; an advantage not found in a number of other anti-dazzle attachments is that it may be fitted to any type of lamp quickly and easily, the only operation required being the drilling of one hole through the centre of the lamp glass.



A sketch showing the device attached to lamp. The vanes are operated from the driver's seat by Bowden wire.

The inventor, who has recently patented the device, informs me that he is anxious to market it and would be glad to hear from anyone interested in his project.



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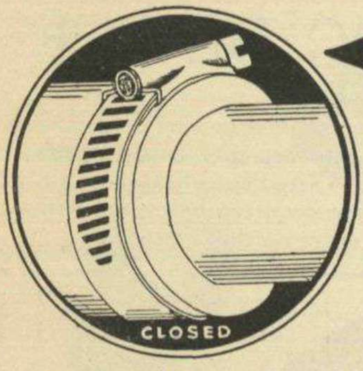

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CLUB NEWS

Mosely and D. M.C.C.

THE headquarters are now at the Pack Horse Hotel, Alcester Road, Birmingham, where a club and social meeting is held weekly on Thursdays at 8.15 p.m. The club, which has an attractive programme of sporting events, will welcome a few amateur riders as new members ; the annual subscription of 5s. covers the twelve months from the date of entry. Interested riders should communicate with Mr. A. Grace, 17, Osborne Road, Sparkhill, Birmingham.

Lisburn M.C.C.

At the distribution of prizes to the successful competitors during the past season it was stated that, with a membership of 114, the club was now the largest within the area of the Ulster Centre M.C.U.I.

The chairman for the occasion was Mr. Cecil Webb, principal of the Lisburn Technical Institute, but perhaps better known as the designer of the Webb two-stroke engine. The chairman of the Ulster Centre M.C.U.I. was also present and congratulated the club on its wonderful season.

Tunbridge Wells M.C.

The annual dinner and prize distribution will be held on Wednesday, January 8th, at the Royal Mount Ephraim Hotel, commencing at 7.30 p.m. The mayor and mayoress have consented to be present. Dancing will continue until 2 a.m. The toast list has been considerably curtailed.

Early application for tickets (7s.) is essential, as it is not possible to seat more than 100.

Enfield and D. M.C. and C.C.

The seventh annual dinner was held at the Abercorn Rooms on Wednesday, December 4th. There was quite a representative gathering of members and their friends, and once more Prof. A. M. Low, the president, took the chair.

Responding to a toast proposed by Mr. H. B. Barrett, the professor indulged in a few witty reminiscences of previous dinners that he had attended. Later in his speech, however, he spoke in more serious vein of the work undertaken by the R.A.C. in fighting the cause of the motorcyclist and the motorist in connection with the proposed regulations affecting the weight of motorcycles. He also complimented the Enfield Club on the way its members had supported the various events organized by the governing body.

Mr. W. E. Todd, the hon. secretary, stated that the membership was greater than it had ever been, and was still increasing in a most encouraging manner. Lack of interest in social runs, however, was rather a fly in the ointment, but this could be remedied, he suggested, if the ladies would help. This point was also emphasized by Mr. D. C. H. Livingston when he proposed the toast of " The Ladies."

The presentation of awards was followed by dancing and the affair continued until a very late hour.

Leytonstone and D. M.C.

New members enrolling now will be entitled to membership until December 31st, 1930. Particulars will be supplied by Mr. G. C. Smith, 43, Cobbold Road, Leytonstone, E.11.

B.R.D.C.

Such was the success of the first race promoted by the British Racing Drivers' Club, which made its bow with the immensely successful 500 Miles Race run at Brooklands on October 12th last, that next year's event on similar lines, which is to take place at Brooklands on Saturday, October 4th, has been placed on the International Calendar, and will therefore be known as the B.R.D.C. International 500 Miles Race.

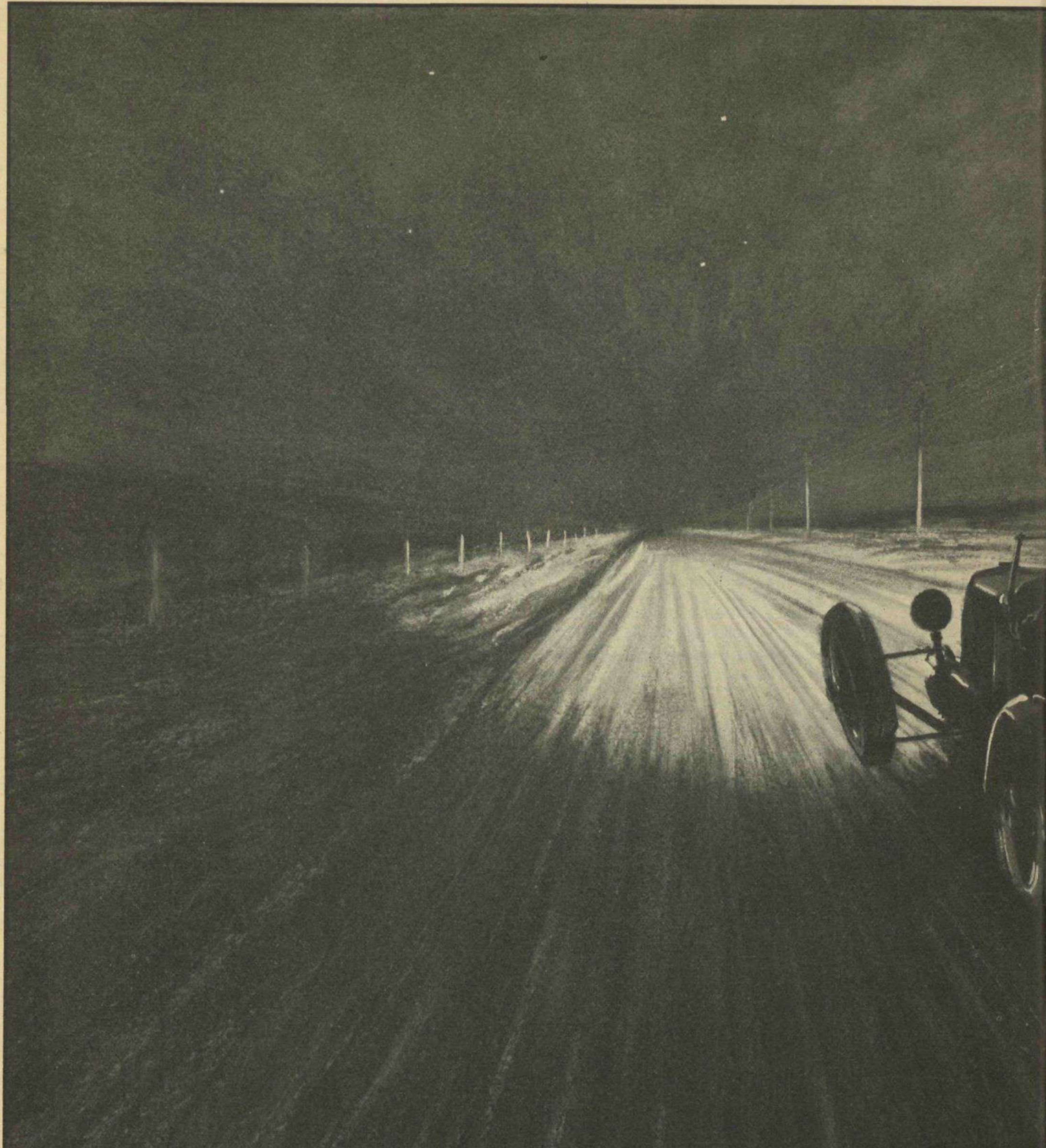
Motor Sport in Australia.

The East Brisbane Auto Club held a very successful hill-climb on Mount Gravatt recently, when a large and enthusiastic crowd gathered to watch the sport. The surface was deeply rutted by rain. The fastest climb was made by a Chandler and the best time in the standard car class—a handicap event—was made by a Morris Minor driven by J. V. Giles. A Salmson was fourth in this class and an Austin Seven tenth.

Sunbeam M.C.C.

An event of great interest and novelty will be the Pioneer Run, for motorcycles, tricycles and quadricycles, which the Sunbeam Motor Cycle Club is to hold on February 2nd, in conjunction with the Association of Pioneer Motorcyclists ; any owner of the necessary machine may enter. The start will be from the Aerodrome, Purley Way, Croydon, and the finish will be at the Pylons, on the outskirts of Brighton, lunch being taken in Horley and tea in Brighton after the finish.

Entries will close on January 22nd and all details of the trial, together with entry forms can be obtained from the hon. secretary of the meeting, Mr. F. W. Pinhard, 3, Wavertree Road, London, S.W.2.



Motor Sport Copyright.

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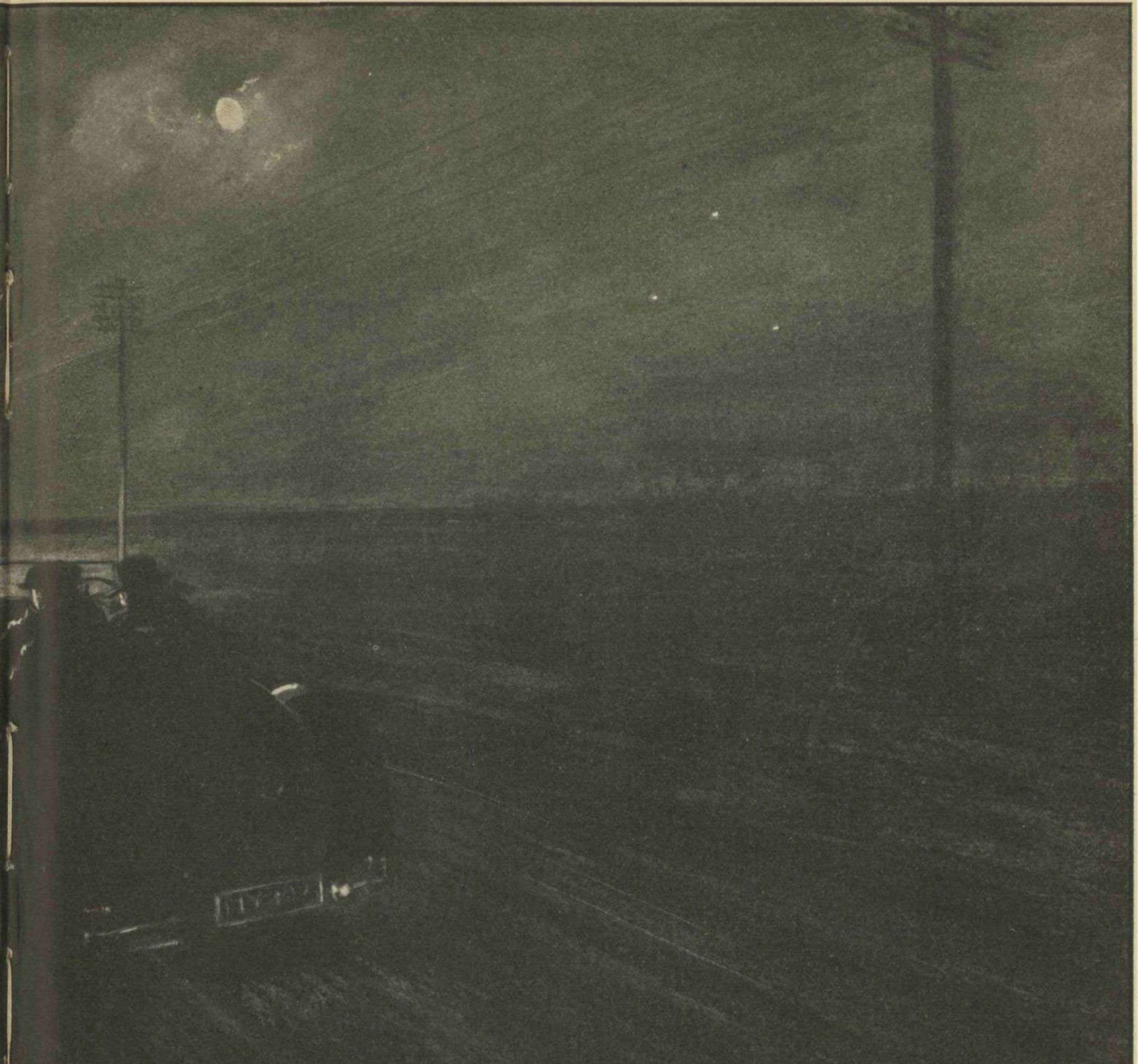
To gain the tim



lated traveller apace
ly inn,"

Drawn by R. A. NOCKOLDS.

ACCELEROMETERS

What They Indicate and How They Work.

By B. G. MANTON, B.Sc., A.M.I.C.E.

A SPEEDOMETER has become a built-in component of every car's equipment and an engine revolution counter is a standard fitment on the facia board of many sports models and not a few of the more expensive tourers, but an accelerometer, although of considerable use and interest, seems to be looked upon by many drivers as a highly complicated and mysterious instrument whose indications are incomprehensible to anyone but a fully qualified engineer, although this is by no means the case.

There are many different types of accelerometer, designed for as many different purposes—some are certainly cumbersome and elaborate, with electrically driven self-recording mechanism which draws out a chart showing exactly how the acceleration changes throughout a given period of movement, but others are remarkably simple and compact and among these there are two, in particular, which are specially intended for the use of motorists and automobile engineers—the "Wimperis" and the "Tapley" instruments.

Both are entirely self-contained, requiring no connection to any moving part of the vehicle, and a great deal of useful information may be obtained from their readings without any profound technical knowledge. They enable an accurate analysis and definite measurements to be made, under ordinary running conditions, of every feature of a car's performance, giving the values, for instance, of engine pull and acceleration on each gear, braking efficiency, road gradients, losses due to friction in the car's mechanism and the combined effect of wind pressure and road resistance; moreover, if the weight and the speed of the vehicle are known, an accelerometer provides a quick and simple means of determining the brake-horse-power at that particular speed.

The "Wimperis" Accelerometer.

The "Wimperis" instrument is a very handy litlet appliance, the entire mechanism being enclosed in a brass case, about four inches in diameter and three inches in depth. When in use it is placed on the floor of the vehicle, or on any convenient flat platform, with the circular faces of the casing in a horizontal position. The bottom of the case has two fixed supports and an adjustable levelling screw and the upper face is glass-covered, revealing a graduated dial and an indicating pointer, rather resembling a speedometer. The instrument must be placed in such a way that an arrow on the dial points in the direction of motion of the vehicle and must be levelled up carefully so that the pointer indicates zero when the vehicle is stationary on a level stretch of road. The scale is graduated to read acceleration and retardation in "feet per second per second," these indications being supplemented by gradient readings, marked in red numerals, since the instrument also acts as a gradient meter when the vehicle under test is either standing still or travelling at a uniform speed.

The expression "feet per second per second" has a somewhat cryptic sound and requires, perhaps, a little further elucidation. Imagine that a car is speeding up from a standing start and that its velocity is read from a speedometer at the end of every second, the readings being, 5, 10, 15, 20, 25 and 30 miles per hour respectively. The speed is obviously increasing by 5 miles per hour during every interval of one second and we may therefore state that the acceleration is 5 miles per hour per second. But 5 miles per hour is equivalent to 7.3 feet per second and, adopting the standard method of enumeration, the acceleration, in the form of "feet per second per second" is, consequently, 7.3.

Working Principle.

The working principle of the instrument depends upon the movement of a thin metal disc, mounted on a vertical spindle so that it can spin round in a horizontal plane. The disc is made "lop-sided," or out of balance, by the simple expedient of cutting out a hole eccentrically, so that the centre of gravity no longer coincides with the geometrical centre about which it is pivoted. The support, however, is sufficiently rigid to keep it horizontal, while permitting free motion around the vertical axis. When the arrow on the dial is pointing in the direction of motion and the pointer is reading zero, the disc is so placed that its lack of balance will have a maximum effect and a rotary movement ensues as soon as the vehicle moves forward. The spinning motion of the disc is controlled by a coil spring and damped by a simple magnetic device to keep it within reasonable bounds and is conveyed to the indicating pointer through a train of gear-wheels, the weights of the various moving parts being proportioned with extreme care so that the amplitude of the swing set up in the disc, and reproduced by the pointer, gives an accurate measure of the acceleration, or retardation, over a wide range.

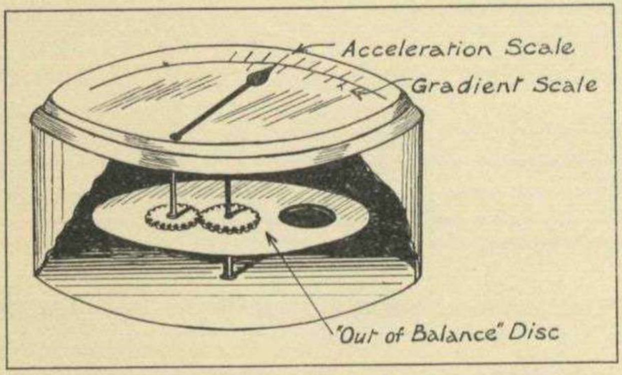
When acting as a gradient meter, the whole instrument, of course, assumes a tilted position, corresponding to the slope of the hill, and the disc swings round until a position of equilibrium is reached, whereupon the pointer will indicate the appropriate gradient.

ACCELEROMETERS—continued.

The Tapley Performance Meter.

The "Tapley Performance Meter" is made in several forms and may be attached permanently to the facia board, or the steering column, or temporarily attached to a special bracket and thus changed over easily from vehicle to vehicle.

Like the "Wimperis" instrument, it is very compact and quite self-contained, but its working principle is different, depending, as it does, upon the action of a pendulum. The latter is pivoted so as to swing to and fro in the direction of motion of the car or cycle, and, in order to damp down the oscillations, which would, of course, be too jerky for accurate observations under running conditions if entirely uncontrolled, the heavy swinging arm and its pivot are enclosed in a sealed case, filled with a special liquid. The underside of this case is made of very thin copper and the pendulum itself is magnetised with sufficient intensity to influence a second pivoted arm which swings to and fro *outside* the sealed case and, by this simple method of magnetic attraction, exactly reproduces the motion of the controlling pendulum within. The motion of the outside arm is transmitted through gearing to a revolving scale which is visible in a small window in the dial of the instrument, the indications being read off against a fixed index mark. One popular pattern of the "Tapley" meter gives dual readings—the engine pull in "pounds per ton" and the gradient value, and although acceleration is not directly registered, the instrument is, like the "Wimperis" type, a combined accelerometer and gradient indicator. This latter feature, however, will only function accurately when the vehicle under test is either stationary or moving at a uniform speed.

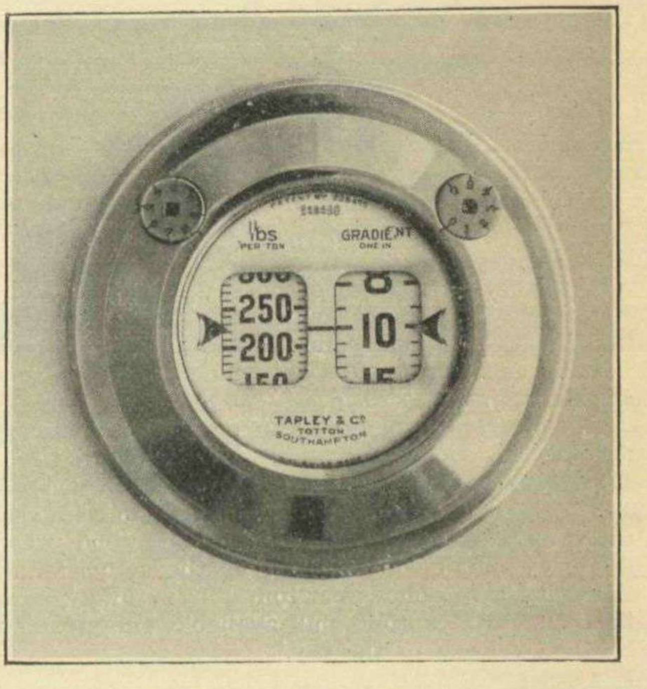


Diagrammatic Sketch of the "Wimperis" Accelerometer. This shows the working principle only and omits all details of the damping and controlling mechanism.

The "Pounds per Ton" Unit.

Both the engine pull and the resistances overcome thereby are very frequently expressed as so many "pounds per ton weight of car" and this mode of valuation may be visualised by imagining that the vehicle under test is coupled to a trailer which, itself, is weightless and frictionless. The forces resisting motion under ordinary running conditions are the wind pressure, the frictional resistances in the mechanism, and the friction between the tyres and the road, while we have, in addition, the gravitational resistance which occurs when the vehicle is ascending a gradient. We must next imagine that these forces are represented by weights and that they are removed from their respective spheres of action and loaded on to the frictionless and weightless trailer and we will suppose that the coupling between the trailer and the leading vehicle consists of an ordinary spring-balance. When the vehicle begins to move, a certain pull will be registered on the balance, corresponding to the initial acceleration from a standing start and, as the speed settles down to a steady figure, the reading of the spring-balance will diminish and then remain stationary until some change occurs in the gradient, the wind pressure, or the nature of the road surface. The reading of the balance in pounds divided by the weight of the car in tons will give the engine pull in pounds per ton, at any instant, needed for overcoming the sum total of the various resistances to motion. If, however, the speed is not constant, the indications of the spring-balance will show the extra pull needed for producing acceleration.

By a well-known law of mechanics, a pull of 70 pounds per ton will produce an acceleration of one foot per second per second and a resistance of 70 pounds per ton will produce a retardation of one foot per second per second, provided, in both cases, that the mass on which the force is acting is perfectly free to move. It therefore follows that if an acceleration, or retardation is recorded as so many feet per second per second, as in the case of the "Wimperis" instrument, this figure multiplied by 70 will give the force in pounds per ton which is causing the change in speed.



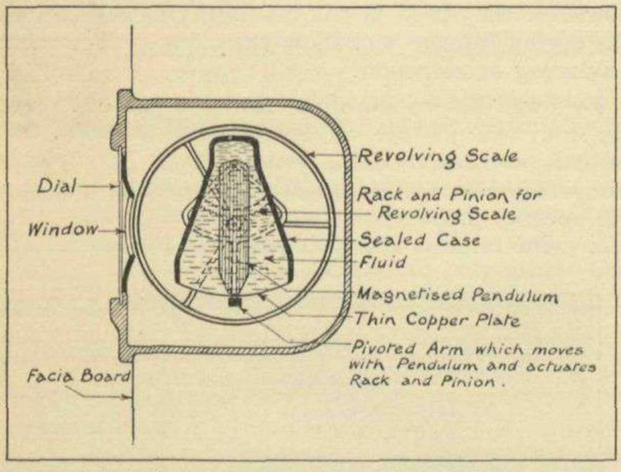
The "Tapley" Performance Meter. The dial shows "Pounds per Ton" on the left hand scale and gradients on the right hand scale.

ACCELEROMETERS—continued.

What an Accelerometer Tells.

As an example of the utility and interest of both the "Wimperis" and "Tapley" instruments let us consider two simple tests, with some typical figures which might well be obtained in actual practice :

First, imagine that a car is speeded up to 35 miles per hour on a level road and the ignition then switched off, so that the various resistances to traction will come into play unhindered and thus produce a retardation. Suppose that the retardation reading on a Wimperis instrument, when the speed has dropped to 30 miles per hour, is 1.4 feet per second per second. This corresponds to a retarding force of 1.4 x 70, or 98 pounds per ton, and this figure would therefore appear on the dial of a Tapley performance meter, were we using the latter. This represents the sum total of all the "slowing-up" influences on the level and the engine must develop an equal pull of 98 pounds per ton if they are to be counteracted and the car propelled at a uniform speed. It should be noted, however, that both instruments will read zero at constant velocity on a level road and the engine pull needed for neutralising the tractive resistances is consequently unrecorded during the actual running and can only be determined from the retardation test just described.


Dial
Window
Facia Board
Revolving Scale
Rack and Pinion for Revolving Scale
Sealed Case
Fluid
Magnetised Pendulum
Thin Copper Plate
Pivoted Arm which moves with Pendulum and actuates Rack and Pinion.

The "Tapley" Performance Meter.—A diagrammatic section showing the working principle. Several details are omitted for the sake of clearness.

If, however, the engine can develop a greater pull than the 98 pounds per ton previously referred to, the *surplus* pull will be converted into acceleration which will be registered immediately on a Wimperis accelerometer as so many feet per second per second, whereas a Tapley instrument will tell us the actual value of that surplus in pounds per ton, and, naturally enough, the greater the surplus pull available, the greater will be the liveliness of the car.

On Hills.

But our surplus may also be absorbed in climbing a gradient and here we come across another simple relationship : the ratio between the vertical rise of a hill and the length of the slope is the same as the ratio between the force needed to overcome the resistance due to gravity and the weight of the car. If the hill has a grade of 1 in 12, for example, this means, strictly speaking, a rise of 1 foot for every 12 feet measured horizontally, but unless we are considering gradients of about 1 in 4 or steeper, the horizontal distance is very nearly the same as the length of the slope, and we may say, without serious error, that the ratio 1/12 representing the gradient is the same as the ratio between the pull required to overcome the effect of gravity and the total weight of the vehicle, i.e., for every ton of the latter the engine must exert a pull of 1/12 ton, or 187 pounds, in counteracting gravity alone.

We now come to our second test : this is to discover the gradient which the car will climb "all out" at a steady 30 miles per hour—the same speed as that used for the retardation test. Suppose, for convenience, that this gradient is the one previously referred to, namely 1 in 12. Both the Wimperis and the Tapley instruments will record the slope on their gradient scales and the latter, in addition, will show the corresponding pull of 187 pounds per ton absorbed in overcoming the gravitational resistance. Hence the *total* pull now being developed by the engine is (i) 98 pounds per ton for overcoming the tractive resistances discovered from the retardation test, which, of course, are the same on the hill as on the level road provided that the type of surface and the wind pressure are the same, plus (ii) 187 pounds per ton for overcoming the gravitational resistance of the incline. This gives a total pull of 285 pounds per ton weight of car.

Finding the B.H.P.

If we know, in addition, the total weight of the car and its load, we are now in a position to ascertain the brake-horse-power developed at 30 miles per hour in top gear. This is done by means of a simple formula, thus :

Multiply the total pull by the weight of the car in cwts., and the speed in miles per hour, and divide the product by 7500. If, for instance, the weight of the car under test is 25 cwts., the available brake-horse-power at 30 m.p.h. in top gear is :

$$\frac{285 \times 25 \times 30}{7500}, \text{ which gives } 28.5.$$

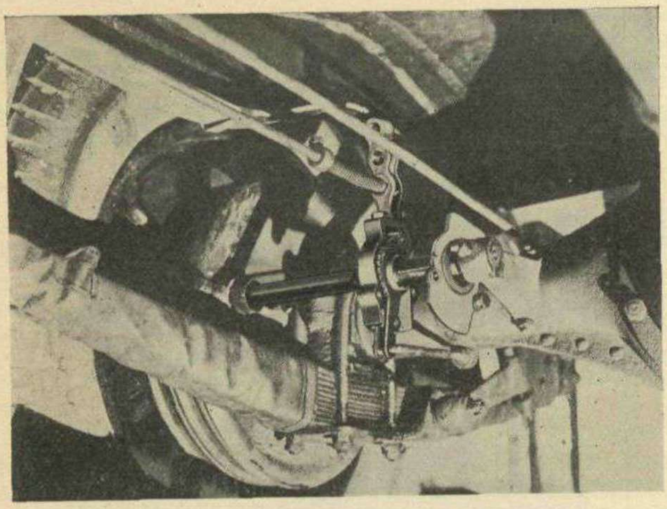
It will be appreciated from this that an accelerometer enables an owner-driver to obtain valuable information concerning his car's performance in a far more precise form than that derived from a road test with a speedometer only, and for determining such a vital detail as the brake-horse-power, under various conditions, the quick and simple accelerometer method presents a marked contrast to the only other alternative : that of mounting the car on a special test-bed with all its elaborate instruments and mechanism—a proceeding entirely impossible for the ordinary driver, who may, nevertheless, desire to take an intelligent scientific interest in his car's behaviour.

Several motorcar factories have excellent test tracks surrounding their works, but the track which has just been built by the Hillman company is unique in that its surface has been purposely roughened to approximate Colonial conditions.

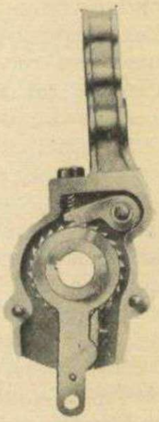
Tests on this new track in no way replace the usual extensive road tests. They are in addition to them and are carried out mainly with a view to discovering body rattles or imperfections in the springs, shock absorbers and steering. If any minor faults are found they are rectified on the spot ; this is obviously more effective than later adjustments in the final test shop.

SELF-ADJUSTING BRAKES

And Other Technical Items



The photograph on the left shows the S.B.R. attachment in position on a car. On the right is seen the arm complete with ratchet mechanism.



PROBABLY no point in the routine attention to a car is more irksome to the average motorist than that of brake adjustment and consequently the S.B.R. brake regulator, which has been placed on the market recently, should be of particular interest. As can be seen from the accompanying illustrations it consists of a form of lever (incorporating a ratchet device) which takes the place of the orthodox brake cam lever. The whole is pivotally mounted upon a spigot on the inner boss of the ratchet wheel, which is keyed to the camshaft. As wear in the brake linings occurs, the lever moves the ratchet so that a tooth is taken up by the pawl, this action giving the whole just sufficient travel in the " off " direction to maintain the right clearance between the brake shoes and drums. The retention of a correct adjustment is, therefore, entirely automatic. The makers are : S.B.R. Patents, Ltd., Marcol House, 293, Regent Street, London, W.

Servo Brakes for Motorcycles.

WHEREAS servo brakes of one type or another are almost universal on high-class cars, there are no motorcycles at present standardised with them ; and whereas, again, almost every car has its front and rear brakes interconnected, very few motorcycles embody this design, the most notable exception being the Rudge-Whitworth.

It is therefore interesting to note that the Bendix Brake Co., manufacturers of the well-known car brakes, have gone very closely into the matter of servo brakes for motorcycles and have evolved a system which has been fully tested and has proved to be most effective, The mechanism is of exactly the same type as that employed for cars and the arrangement is such that the brakes can be either interconnected or independent.

Several leading manufacturers, are experimenting with these duo-servo brakes and important developments may be expected in the near future.

Hydraulic Shock Absorbers and °F.

SOME experienced motorists have viewed with misgiving the general adoption of hydraulic shock absorbers.

As the name implies, these depend upon the free flow of a liquid, such as oil. Obviously in a climate like that of this country, where the temperature varies between very wide limits, the action of the absorber would vary according to the fluidity of the liquid.

Some adjustment could be provided, in fact, is provided on some makes, but it is quite certain that the average owner driver is not going to study the thermometer every day and dive under the axles to adjust his shock absorbers.

Amongst the first to adopt hydraulic shock absorbers were the Singer Company. Their solution of the problem of temperature variation is in the liquid used.

It is an emulsion, i.e., a compound of liquids (such as oil and water) which do not ordinarily mix, but which can be made to do so to a certain extent by forcible treatment in a special machine. Alcohol is one of the ingredients, so that the free-flowing properties of the final mixture are unaffected by cold.

AH SING LOOKS AT THE EXETER.

An Intimate but not Too-authentic Account of the M.C.C.'s Classic Run.

THE institution which houses me during the hours of daylight includes among its inhabitants Argentines ("without means"), Portugees and Greeks—and a Chinaman. Ah Sing does not wear silken robes but Harris tweed plus-fours: does not ride in a palanquin but on a 500 c.c. sports model: does not speak Chinese (at any rate in our hearing) or English—but a somewhat fanciful combination of the two, flavoured with Americanisms and garnished with sprigs of almost every other language. When I returned after the Christmas vacation I remarked casually (with a good deal of ill-subdued pride) that I had "satisfied the examiners" of the M.C.C. and obtained a Gold Medal in their London-Exeter run.

"Me go Exeter lun too," remarked Ah Sing.

"Oh, sorry not to see you at Slough—" I began.

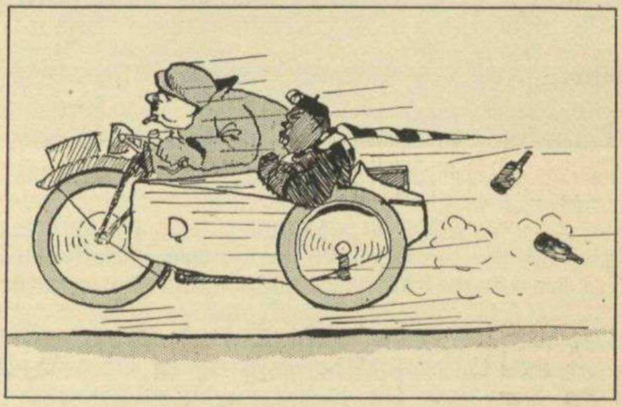
"No, no, Ah Sing go Exeter allee way, all lay with Mister Gelald Hambone in honorlable couch wheel," and he beamed.

Now Gerald Hambone is the roughest man of all: he drives a big twin with a side-car like an undertaker's apprentice's first attempt at a coffin: he welcomes punctures in an all night trial to enable him to "make up time": his machine may run on petrol but he runs on cold rum and water—and his consumption is that of a Schneider Cup seaplane. I had seen his name among the entries and welcomed the fact that I was on a solo machine separated from him by a hundred or so other entries, for Gerald has invented a game, the essence of which is a high speed "pub crawl" in which second man pays for drinks. When Gerald pays—well, as Esquimau Nell says, "It may not be rare in Berkeley Square but it is on the Rio Grande"—or on the high-roads of England. I had also noticed that Gerald was not among the finishers and had been somewhat surprised to see his burly frame apparently intact in his favourite place of refreshment about New Year's Day. He had not mentioned the Exeter.

Business was pressing at the moment and it was not till a few days later that I had an opportunity of pumping Ah Sing. Forgive me if I fail to reproduce his jargon realistically but the substance of his remarks was as follows.

"Mister Gelald he go Exeter 'long Miss Florla by damn" (Flora is a young lady—"poor but reasonably honest"). "Klissmass, they go blindo celeblation. Miss Florla say she damn and blas' she go Exeter—why Mister Gelald go, by jiminy? She like gin eyetahlian not mud'an'lain. Mr. Gelald no gent by heck. Yessir, Miss Florla she shout all one piecey hellcat and Mister Gelald go mad, tell her go boil headpiece. By gar, Mister Gelald he say Ah Sing he come 'long Exeter by hell. Me one piecey Engliss sportsman wee wee. "Bimeby, Mister Gelald he say Ah Sing this goddam' Exeter, dam' side too far, Klissmass dam' side too cold, motor dam' side too knock knee, all long dam fool game.

"Howsomever Mister Gelald he fetch Ah Sing with motor and number one topsidey couch wheel for honorlable self. Thlu' Westend—wouf! Slough—wouf! By gar, one hell big conglegation motors, couch wheels, autos, gentles in velly showerploofs—dam' pletty girls in like what poly bear he wear in Legent's Park. One big King Man in black hat he say go and a man go and Ah Sing say 'Mister Gelald—Go' and Mister Gelald say Don't be a dam' fool Ah Sing: this no b— lace—not yet: this 'liability tlial.



West End—Wouf! Slough—Wouf!

"All gentles go off and Ah Sing he lie in couch to tly come off with pletty girls, but no dam— good. Then Mister Gelald come back and sing, and put tlee bottles in couch wheel and say 'That'll do till Exeter.' King Man in black hat he say go and Mister Gelald has permiss'n take Ah Sing Exeter by jiminy.

"Soon Ah Sing go sleep till Mister Gelald sing velly loud, 'Get out you Chink and mend puncture.' Ah Sing no Chink he Chinee gentle; tell Mister Gelald no mend puncture, no dam' galargee, me couch wheel occupanter—night, night. Ah Sing think Mister Gelald vulcanize patch, with vocal chords.

Bimeby we go 'long again too click so Ah Sing lap head in lug, and tink he in bed in Bloomsbly, all 'long night till Mister Gelald say, 'Thank God, Yeovil.' We dlink coffee all hot and Mister Gelald he swallow bottle in couch wheel and say Aaaaaah! Soon Ah Sing know it lain and say damn: Mister Gelald he say damn too and swallow 'nother bottle and go like hell.

"Soon we come to a gleat mountain and many spectors and Mister Gelald insert lower latio and go up—bang—bang—and then gleat bang and noise and gentles shout and Ah Sing see we stop. Mister Gelald he no say

AH SING LOOKS AT THE EXETER—continued.

"Mend chain"; he stand and damn and blast an swallow 'nother bottle. Pletty girl she come and ask honorlable signature in handsome volume and Ah Sing think him dam' kind and lite 'Alec Bennett' on one page and 'Perfesser Low' on 'nother. Then Mister Gelald mend chain and look for 'nother bottle to swallow and say damn and tell Ah Sing lead loute card.

"Ah Sing no dam' fool: Mister Gelald he dlive too goddam' click so when plinted dilections say left Ah Sing he holler "Light" and versi vica. Soon Ah Sing see no more motors and think Mister Gelald him see dam' all evlything. Honorlable couch wheel him go lound bend like notable Splouts and go down mountain like notable Sir Lord Seglave. Then Ah Sing he see dilectional indicator 'Ilflacombe two miles' and lay low and say damn all and Mister Gelald go clicker norlever. Then mark me you—whoosh! Ah Sing appear to lecognize bosom of mighty ocean but Mister Gelald yell 'B— duckpond.'

"Ah Sing he no laugh—he say 'Mister Gelald you velly kind take Chinee gentle motor dlive: you go bye bye in honorlable couch wheel. Ah Sing go home Bloomsbly—night night.' Mister Gelald him say damn bad words and fall in duck pond and Ah Sing lun like hell."

We have started a fund to provide a decent funeral for the first man to mention "Exeter" in Gerald Harwood's presence.

TOUGHER THAN THE "EXETER."

One of the most important events of the year "down under" is the Sydney-to-Melbourne and back trial. In the 1929 test weather conditions were very severe as were the regulations.

All bonnets were sealed and the competitors were required to drive from Sydney to Melbourne, a distance of 572 miles, *non-stop* except for the stipulated time at controls. They arrived at Melbourne in the evening and the cars were then locked up until the following afternoon when the return trip, over the same route, was started.

Throughout the whole of the second day's run, a violent head-wind was encountered and blinding dust, "V" gutters, creek beds and mountain ranges contributed to the difficulties, especially in view of the fact that an average speed of 26 m.p.h. was set. Two of the smallest cars in the trial were Junior Sports Singers and both finished without the loss of a single mark.

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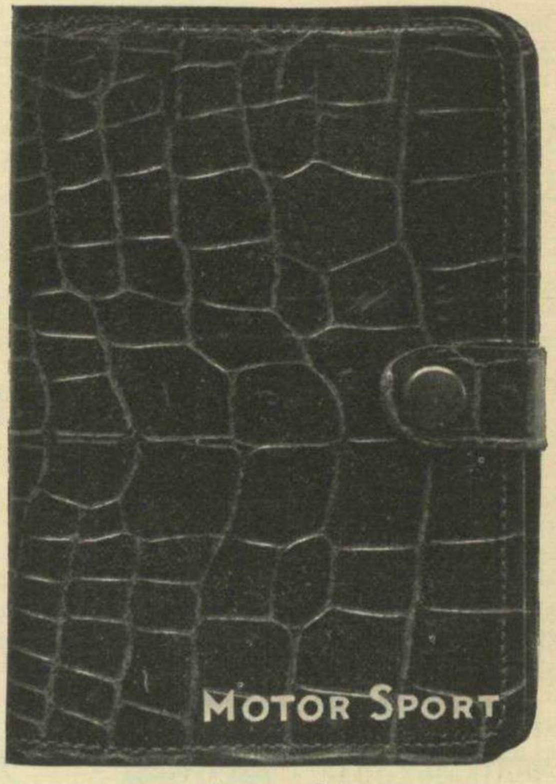

ACTUAL SIZE

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AIR

The Ultra-Light 'Plane

The Possibilities of the Construction of a "Motor-Cycle of the Air" Discussed from the Designer-Manufacturer's Point of View.

By C. W. TINSON, F.R.AE.S.

DURING the last few years the light aeroplane movement has made rapid strides in Great Britain, and is spreading both to the Dominions and abroad.

There are some thirteen light aeroplane clubs working in England, and one in Scotland, whilst others are in process of formation, conclusively demonstrating the popularity of what has been called "communal" flying. In addition, we have several flying schools which are run on slightly different lines, but which are turning out potential owners of aeroplanes, when such come within their means.

Now, the light aeroplane movement has been made possible by the advent of a two-seater aeroplane of reasonable price and low running cost, of which the De Havilland "Moth" and the Avro "Avian" are the better known examples, and the quantity of these now being constructed in series has already permitted a considerable reduction of price to be made. The price of a two seater machine of this class is still such, however, that the number of private individuals who become purchasers of them is comparatively small.

If it were possible to market an aeroplane at about half the price of the present-day two seater light aeroplane, there is no doubt that the number of private owners would rise by leaps and bounds, for the price would then begin to compare favourably with that of a good quality sports car. The object of this article is to study the problem and record a few suggestions as to possible lines along which a cheap aeroplane might be developed.

Before an aeroplane of any kind can be designed it is necessary of course that a suitable power. unit is available for propelling it, and in the case of an aeroplane to sell at a fair profit at the price suggested, namely from £350 or thereabouts, the engine must be obtainable for a really moderate sum, say from £65 to £95 complete.

It has been demonstrated that 32 h.p. is sufficient to fly a two-seater aeroplane, the light aeroplanes at the Lympne Competitions of 1924 being fitted with motors of this power. The performance of these machines however, was below that required to make the aircraft, as two seaters, an attractive proposition, but when flown as single seaters, their performance was fairly reasonable. When used as single seaters these aeroplanes were carrying more wing area than was necessary of course, and consequently the sizes all round were larger than necessary for a single seater primarily designed as such. The aeroplane, however, will be discussed later.

The Engine.

The number of suitable aircraft engines of about 30 h.p. which can be purchased for less than £127 is very small, presumably because the demand has been very light, and design and development charges have therefore been borne by a small quantity.

Supposing that a demand makes itself felt, in the near future, it might be reasonably anticipated that the price of the engine would fall at any rate to the higher figure mentioned previously.

Another possibility suggests itself. Supposing that it were found that an existing motor for another purpose could be boosted up to give the power required, then the design charges are greatly reduced, whilst the development cost would be confined to alterations necessary for aircraft service—suitable shaft for a propeller coupling, dual ignition, etc., to such stiffening up of parts which failed on test, and to reduction of weight of parts subjected to less intense stress.

There have been in the past certain four cylinder air cooled motors for motorcycles which immediately suggest themselves as possible of development along these lines, and which would form ideal power units for the required purpose. Assuming the feasibility of this

THE ULTRA-LIGHT 'PLANE—continued.

suggestion, the lower figure quoted for the price might be within sight.

The Aircraft Structure.

In order to produce a really cheap aeroplane, it might be necessary to depart slightly from conventional practice and by so doing to sacrifice economy of weight to a certain extent in favour of economy in money. In other words, a scheme of construction which reduces the man-hours, for production is tolerable, in spite of the result being relatively heavy, so long as it is light enough to give a predetermined performance with the available horse power.

A single-seater fitted with an engine weighing not more than 100 lbs., and carrying in addition to pilot 3 gallons of fuel and 0.5 gallons of oil can be designed for a landing speed of 48 m.p.h. (KL max. .675) for a total weight of 440 lbs. in flying order, and should be capable of at least 94 m.p.h. full out, or say 75 m.p.h. cruising, and of 600 feet per minute climbing rate at sea level. This assumes 30 h.p. as a maximum, and the performance approximates to that of a Cirrus II. "Moth." The speed assumed is somewhat lower than might be expected at first sight, a reduction of 10 m.p.h. having been made to allow for the proportionally large size of the cockpit opening.

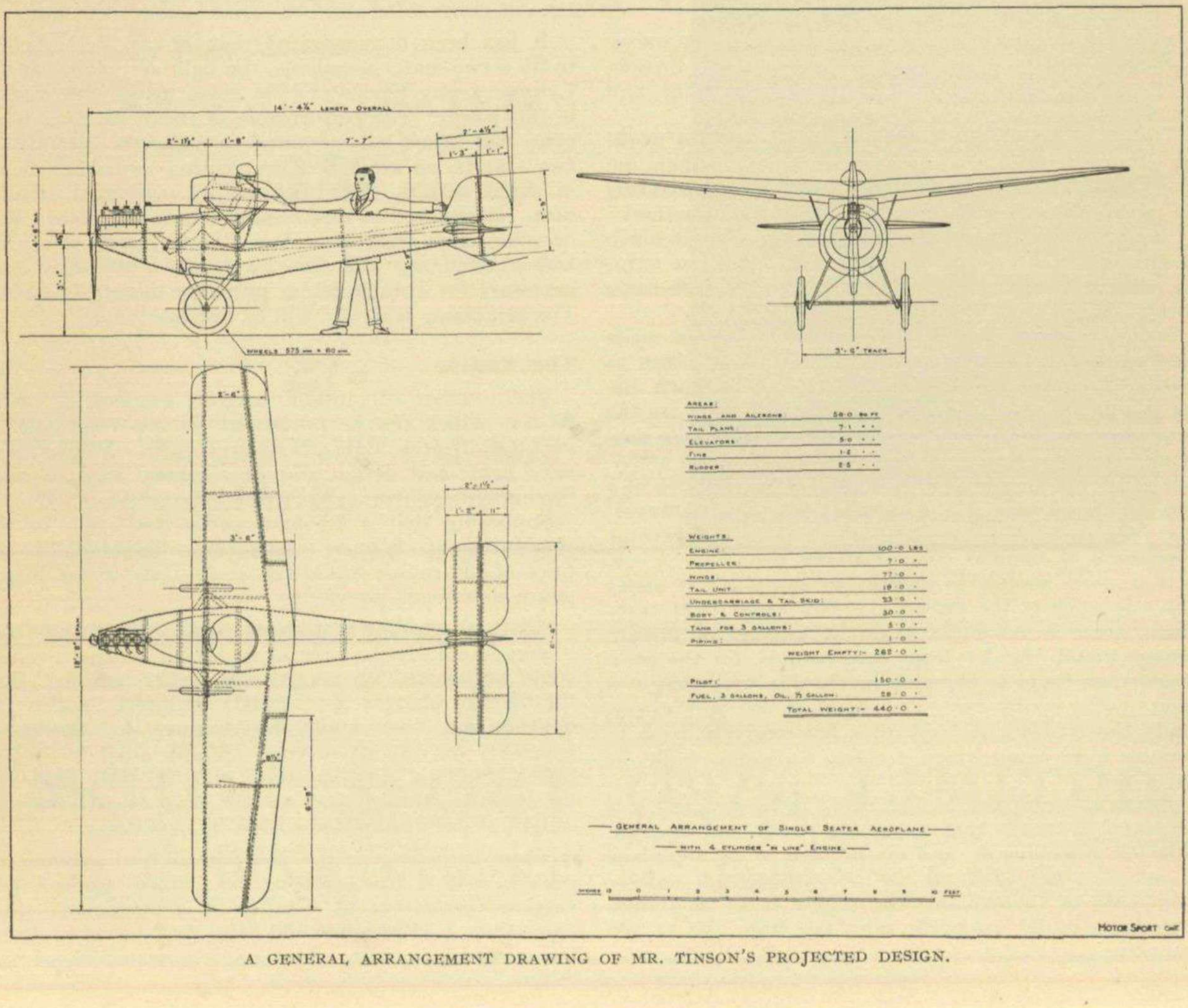
The quantity of fuel carried is small, but should be sufficient to give a flight of 2 hours, or about 150 miles.

Before turning to the construction of the aeroplane, it may be as well to form a mental picture of it (see illustration), in order that the imagination may be brought to bear on the relative dimensions compared to an aeroplane of more normal size.

With a wing section such that a maximum lift coefficient of .675 can be realized, we require 56 sq. feet of wing surface having a span of 18ft 8in. For balance it will be necessary that the occupant be seated between the spars, so the wing must taper in plan giving a mean chord of about three feet.

A high lift section such as is indicated implies considerable camber, and in fact will permit the use of spars about 6in. deep at the root.

The wing characteristics will require a total tail unit area of 16.1 sq. feet of which 12.1 sq. feet will be tail


14'-4¾" LENGTH OVERALL
2'-1½"
1'-8"
7'-7"
2'-4½"
1'-3"
1'-1"
4'-8" DIA.
3'-1"
3'-3"
WHEELS 575 mm × 80 mm
2'-6"
3'-6"
18'-8" SPAN
6'-9"
2'-1½"
1'-2"
11"
6'-6"
3'-6" TRACK
AREAS:
WINGS AND AILERONS: 56·0 SQ FT
TAIL PLANE: 7·1 " "
ELEVATORS: 5·0 " "
FINS: 1·2 " "
RUDDER: 2·5 " "
WEIGHTS:
ENGINE: 100·0 LBS
PROPELLER: 7·0 "
WINGS: 77·0 "
TAIL UNIT: 19·0 "
UNDERCARRIAGE & TAIL SKID: 23·0 "
BODY & CONTROLS: 30·0 "
TANK FOR 3 GALLONS: 5·0 "
PIPING: 1·0 "
WEIGHT EMPTY:- 262·0 "
PILOT: 150·0 "
FUEL, 3 GALLONS, OIL, ½ GALLON: 28·0 "
TOTAL WEIGHT:- 440·0 "
GENERAL ARRANGEMENT OF SINGLE SEATER AEROPLANE
WITH 4 CYLINDER "IN LINE" ENGINE
INCHES 12 0 1 2 3 4 5 6 7 8 9 10 FEET
MOTOR SPORT

A GENERAL ARRANGEMENT DRAWING OF MR. TINSON'S PROJECTED DESIGN.

THE ULTRA-LIGHT 'PLANE—continued.

and elevators, and 4.0 sq. feet rudder and fin surfaces, and the distance from centre of gravity to sternpost need not exceed 9 feet for these proportions.

This will give a total length of 14ft. 4¼in. whilst the height, to give a suitable propeller clearance and wing incidence on the ground, need not exceed 5ft. 6in.

Like the wing, the tail unit may be profiled with considerable camber.

Bearing in mind that it would be practically impossible to build so small an aeroplane with all members of theoretical strength (because if so they would then be too frail), and that reduction in cost will follow if the number of items forming the structure is kept to a minimum, three ply will be utilised as the principal material of construction. Generally, the dimensions are such that 3/32in. 3-ply could be used for the skin of the wings and fuselage, and 1/16in. 3-ply for the tail, with an absolute minimum of stiffening for stabilization.

Taking each half of the wing for instance. This is nominally a 3-ply shell constrained to the desired wing section be being glued and screwed to three or four formers profiled to suit. Owing to the camber of the wing, the 3-ply shell is of considerable section modulus and in fact is sufficiently strong to take the weight of the machine, provided the skin were stabilized against buckling.

It is necessary, of course, that it should be strong enough to carry " n " times the weight, where " n " is the load factor, and as it also requires stabilizatfon, two planks of spruce, about 6in. at the root and 1in. in thickness, are inserted along the span, forming spars, to which the skin is glued and screwed, the combination forming a beam strong enough and rigid enough to do its duty with the load factor superimposed. Any additional local stiffening to prevent the three ply buckling would be put in as found necessary, for the structure would have to be tested of course, because it is not amenable to pure calculation, and the points requiring further stabilization would appear in the course of test.

Simple to Make.

Now if this method of construction is feasible, the wing is composed of a minimum of parts, and no special machinery is required for its production. It remains to be seen whether such a form of construction is permissible on a weight basis.

The construction is not unduly heavy, for as estimated the weight of the wing with its ailerons comes out at 77 lbs., or 1.375 lbs./sq. ft., but assuming that the estimated weight is too low, due to an increased number of internal stiffeners being ultimately necessary, it could hardly exceed 1½ lbs./sq. ft. The construction of the tail unit would follow similar lines except that 1/16in. 3-ply would be suitable owing to the smallness of the surfaces.

The same method of construction is applicable for the fuselage, which would be formed of truncated cones of 3/32in. 3-ply, joined longitudinally by cover strips rivetted on, and to each other by laminated hoops.

The total area of 3-ply for the fuselage would be 70 sq. feet, weighing barely 18 lbs., and costing approximately £5 for material.

Thinner 3-ply could be used at the rear end, but the extra stiffening necessary would increase the production cost.

The form of construction advocated would only be possible for an aeroplane of this size : in larger sizes the number of subsidiary members for stabilization would increase considerably, and normal methods of construction would show up, as now, to advantage.

Component Costs.

Having decided that it is impossible to cut the cost of material required by any further reduction in the size of the aeroplane, or to cut the cost of labour by any further simplification of construction, it remains to tabulate a list of prices for the various components respectively representing the maximum figure allowable, and to form one's own opinion whether it is at all possible to build down to these figures.

A suggested estimation of prices for the components, allowing £80 for the purchase price of the motor complete, ready to instal, is given below :—

ESTIMATED PRICES.

ITEM.	DESCRIPTION.	£	s.	d.
1	Engine at £2·6 per h.p.	80	0	0
2	Propeller at £2 per foot of dia.	9	0	0
3	Wing : Three ply	7	0	0
	Other materials	4	0	0
	Labour	11	0	0
4	Tail Unit : Three ply	2	10	0
	Other materials	1	10	0
	Labour	4	0	0
5	Fuselage : Three ply	5	0	0
	Other materials	2	10	0
	Labour	7	10	0
6	Undercarriage wheels per pair	14	0	0
7	Undercarriage (except wheels) & tail skid	5	0	0
8	Controls	6	0	0
9	Tank and piping at £1 per gallon	3	0	0
10	Instruments : A.S. indicator and pitot	4	17	6
	Rev. counter and drive	5	15	0
	Altimeter	4	15	0
11	Erecting, testing and other charges	12	12	6
12	Packing and delivery to rail head	5	0	0
13	Overheads on all items except 1, 6 & 10	85	0	0
14	Profit, 20%	70	0	0
	TOTAL	£350	0	0

The above figures represent what might be considered possible if the aeroplane were being produced in quantities, and allow for a reasonable amount of scrap and waste, and if the estimates are anywhere near the mark show a profit of 20% per machine at a selling price of £350.

It is important to note that the figures for estimated costs are based on the assumption that the materials are of good, but not necessarily of " aircraft " quality, obtained from sources possibly independent of the aircraft industry.

SLIPSTREAMS

BY

"*RUDDER-BAR.*"

"Come-backs."

WHETHER the art of piloting an aeroplane is one which is lost after one has been away from the stick for a period of years is a question which is raised from time to time, and it seems the prevailing opinion is that it is essential for a one-time pilot to undergo what is virtually a second course of instruction before he can be safely entrusted with a machine again. Personally, I have always held that once one has "learned how" and has got anything over 200 hours solo flying to one's credit particularly if it has been on any of the more vicious breeds of war-time machines, the taking-off, manoeuvring and landing of a normal aeroplane may be done without any untoward happening, even after a long period of retirement.

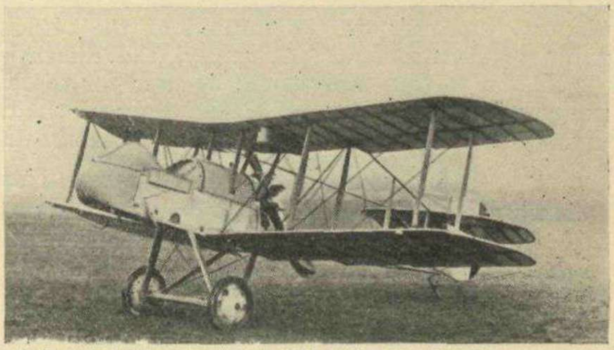
And the statements of two war-time pilots, both of whom have lately returned to active aviation, rather bare out this contention. In reply to my inquiry as to how he felt after a ten years on *terra firma*, one said, "My 'dual' consisted of going up with a pilot who, knowing I was an old hand, simply let me take over as soon as we were unstuck. I flew round for half-an-hour and finished up with a three-point landing. I felt at home at once." My other friend, who also had not flown for ten years, went one better in that he went up unaccompanied. "I was a little coarse, a little clumsy at first, but it all came back to me in a few minutes." he said. Admittedly both are men of experience having flown scout machines overseas as well as having had long spells on instructional and testing work during the 1914-1918 period. But ten years is a long time before coming back to the game.

The Pusher Again?

I thought the old pusher was dead and buried long ago but I understand that in some quarters its revival in light plane form is being strongly advocated. It appears that makers, having reached a stage where they can now produce safe, easy-controllable and comparatively economical machines, are anxious to make the light plane more comfortable and quieter. Noise from the engine and the airscrew, and draughts and drumming caused by the slipstream are the bugbear of the hyper-critical. Put the engine behind, they say, and you will have a quiet and comfortable machine and better visibility.

Many of us who remember the old pusher machines may not be so enthusiastic about the idea, however; 400 lbs. of "whirling incinerator" a few feet from the small of one's back was not calculated to make one feel comfortable in a forced landing in those days, for as a certain Russian instructor at Hendon was wont to remark to his pupils, "Nose too steep down—undercarriage smash-ed—engine through head come!" And, just for old time's sake, here is a picture of a famous pusher scout, the D.H.2.

It was a great machine in its time (1915-1916) and, by its superior performance, enabled the R.F.C. to get the upper hand of the early Fokker. Powered with a 100 h.p. Monosoupape, it had a speed of about 95 m.p.h. and could climb to 6,500 feet in just over 8 minutes.



A distinguished ancestor of the "Moth." The D.H.2 pusher scout.

Old-Timers.

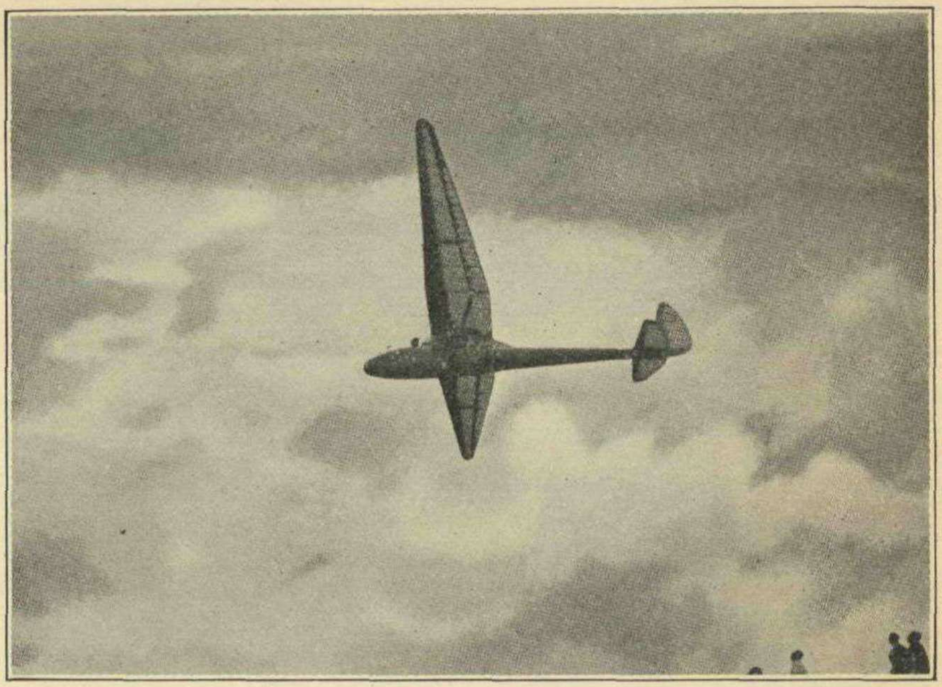
It would be interesting to know, by the way, at what date the last of the real old-timers (exclusive of the Avro 504 of course), was flown in this country. I am ready to wager that it was some four years ago, the pilot being Pashley of the Gnat Aero Co., the machine, an old Grahame-White box-kite with 50 h.p. Gnome engine and the place, Shoreham areodrome. I saw the machine when I was down there in 1925 and Pashley himself recounted to me, with great glee, how, a short time before my visit, he had sizzled round the precincts of the aerodrome in the venerable G.-W., much to the consternation of the Shoreham residents who must surely have thought they were seeing a ghost. That flight proved to be its last, for shortly afterwards it was partially demolished while resting peacefully in a field, by a herd of hostile and hungry cows.

Flying Films.

Since "Wings" was shown in London about a year ago, there have been quite a number of other films produced with the air as their settings. Some of them had better stories than "Wings" it is true, but none equalled the latter in technique and "atmosphere." One is told by a camera man that most of the "shoots" from the air were faked; if this is so, it was very cleverly done for the most critical eye failed to detect any artificiality. The views taken from just aft the pilot's cockpit as he was engaged in dives and ground-strafing were particularly vivid and the "shoots" of machines in formation high above the clouds were most convincing in conveying an impression of coldness, height and isolation. There is tremendous scope for movie-makers in this direction.

THIS GLIDER BUSINESS

REVIVAL OF INTEREST IN FASCINATING PASTIME—A CLUB TO BE FORMED.



OVER three thousand qualified sail-plane pilots—dozens of glider meetings and competitions—over two hundred glider clubs in active operation—that is the record for the past twelve months of a movement which was started but a few years ago by a group of German sportsmen.

Periodically news has reached this country of the progress which was being made in this revived art of motorless flight and mild wonder has been expressed that a man could remain in the air, apparently without motive power, for hours at a stretch, or cruise across country for dozens of miles, or reach an altitude of several thousand feet. "Extraordinary!" people said. "But what is the use of it?"

Now, after a period of apathy people in this country are becoming really interested in what the Germans have achieved and instead of asking "What is the use of it?" are saying "Why don't we start this glider business in England?" Letters on the subject have been received from all over the country by *Motor Sport* during the past few weeks and there are definite indications that the wave of enthusiasm which has raised sail-planing to the position of a national sport in Germany, is gaining ground over here.

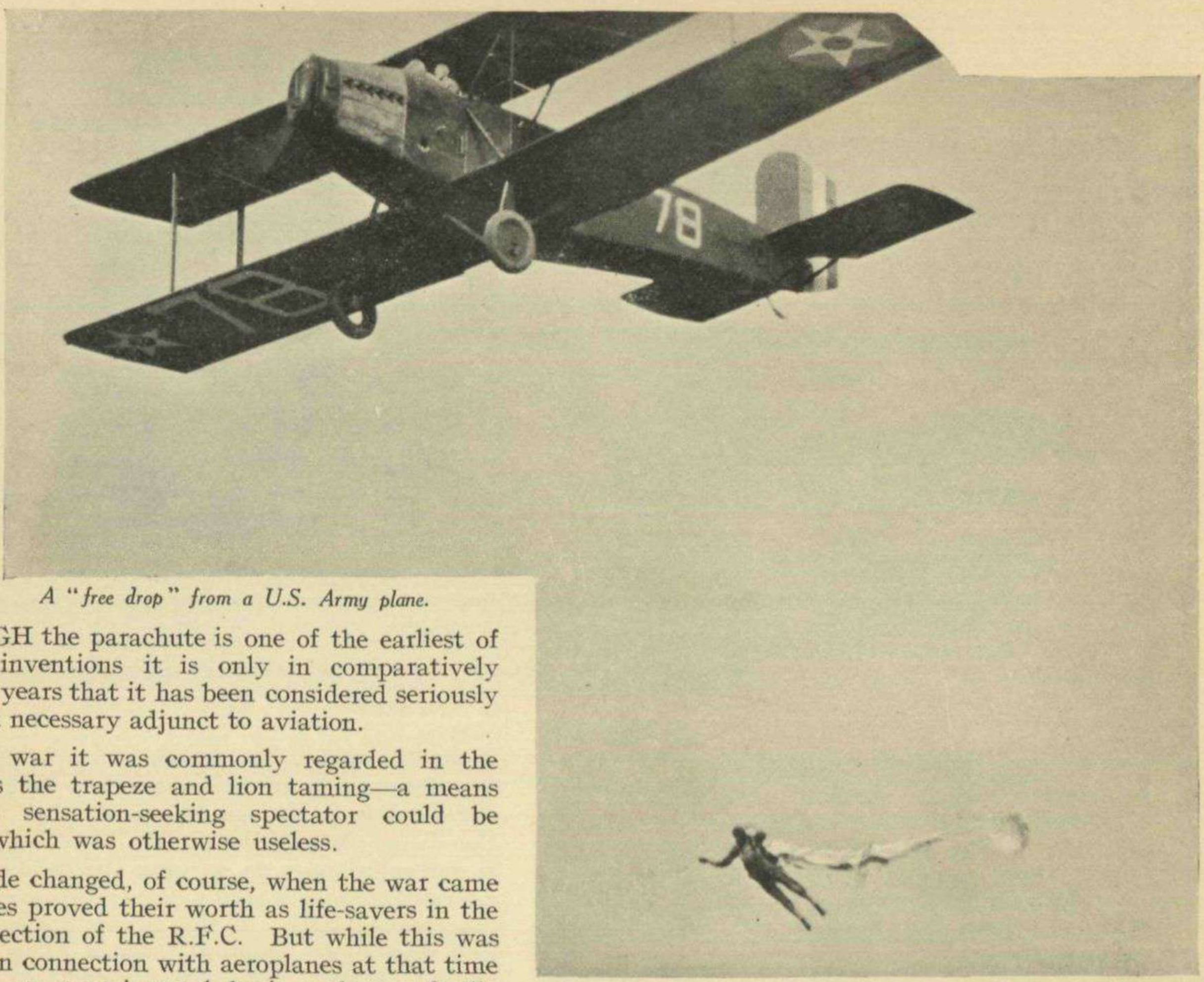
Hitherto one has found that the light aeroplane has eclipsed the humble glider in its greater appeal to the average air-minded sportsman, but flying, even in its cheapest form, i.e., as an aero-club member, is still a fairly expensive pastime and private-ownership is a distinction enjoyed by few.

And what has the glider to offer? In the first place the initial cost of a machine of the simpler type works out at about £45—£50 and of the advanced type with which prolonged flights are possible at about £80. Secondly, under the existing regulations, gliding is free from many of the restrictions laid down by the Air Ministry in the Air Navigation Act. For example, there is no necessity for a glider to be registered, neither is one called upon to secure a Certificate of Airworthiness nor to hold a pilot's licence before one may use a machine regularly. All this means that one may indulge in a thoroughly practical form of flying at extremely modest outlay and untrammelled by bureaucratic legislation.

As to the sport itself, those who have not experienced gliding have only to use their imagination to a slight extent to form an idea of the fascination of handling a sensitive 200 lbs. monoplane—of jockeying it over undulating country in smooth, silent flight. Great scope is available too, in the organisation of competition in connection with records of altitude, duration and distance flights as exemplified by recent events in Germany, and apart from the sporting side of the movement, gliding has a definite value in being admirable preliminary training for those who aspire to piloting powered aircraft.

[Among the letters recently received on the subject of gliding is one in which the writer urges that plans be put in hand for the formation of a club and states that he is sufficiently enthusiastic to offer his services as honorary secretary, while we have received intimation from another quarter that a glider and sail-plane club is in process of formation (in the London area). At the request of its sponsors we invite readers who may be interested in the scheme to get into communication with them. Letters may be addressed to *Motor Sport* offices, 34, Duke Street, St. James's, London, W.1.—*Aviation Editor.*]

THE AIRMAN'S EMERGENCY EXIT



A "free drop" from a U.S. Army plane.

ALTHOUGH the parachute is one of the earliest of aerial inventions it is only in comparatively recent years that it has been considered seriously and used as a necessary adjunct to aviation.

Before the war it was commonly regarded in the same light as the trapeze and lion taming—a means whereby the sensation-seeking spectator could be thrilled but which was otherwise useless.

This attitude changed, of course, when the war came and parachutes proved their worth as life-savers in the kite-balloon section of the R.F.C. But while this was so, their use in connection with aeroplanes at that time was only on an experimental basis and was finally discarded after tests had shown them to be none too certain in action or easy in manipulation. It was one thing to make a jump from a captive and stationary balloon, but quite another thing to get clear from a spinning, aeroplane falling at 130 m.p.h. or so. The difficulty was that the time of opening of the parachute was not controlled by the wearer with the result that his 'chute was liable to become entangled in the empennage of the machine from which he might be attempting to escape. And in addition to this, the apparatus was somewhat bulky and encumbered the airman to a considerable degree. The doubtful practicability of the parachute then for use in aeroplanes coupled with other more pressing needs of the war, influenced the authorities in ceasing their efforts in this direction.

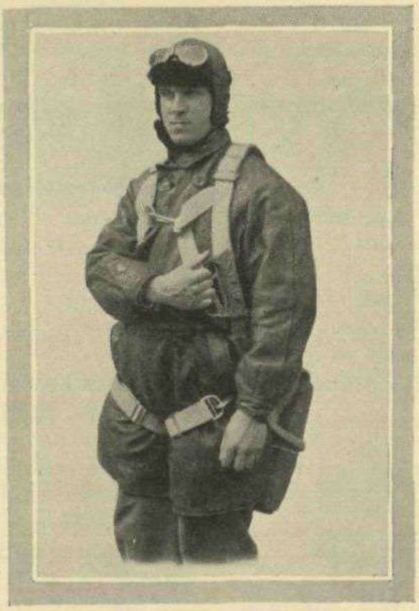
Private individuals and concerns continued the work of developing the parachute, however, and eventually a form was produced which overcame the original difficulties. This type, which was the forerunner of the present standard equipment parachute of the R.A.F. (the Irvin), was known as the "free-type, manually-operated." It was termed the "free-type" because it was carried complete in one unit, strapped to the body of the airman. In this way it differed from the earlier apparatus where the container of the chute was fitted to the machine and the 'chute itself operated by being pulled out as the airman fell from the plane. Thus, at once the danger of the parachute opening too early and fouling the aircraft was done away with as the "free" type operated independently of the plane and could be timed to open by the wearer by a "pull-ring" located on the harness.

Superficially considered, the production of such a contrivance might appear a moderately simple matter, but in point of fact there were many problems and many factors to be taken into consideration before the Irvin type of 'chute was brought to the high standard of efficiency which one finds to-day. In the first place it had to be of such size and so disposed as to give a reasonable degree of comfort to the wearer and allow him to leave his machine with the least difficulty or delay. It was essential, too, that it should open promptly and be able to withstand the sudden shock incurred by the falling of the airman at a high velocity. The harness had to be designed so that the shock of opening was transferred in such a manner as to obviate physical injury, and to prevent the wearer falling out, regardless of his position in the air when the opening occurred.

AIRMAN'S EMERGENCY EXIT—continued.

The possibility of landing in a high wind or in the water had to be considered also, so that it was necessary that the harness be made quickly detachable. Finally the axiom "a chain is as strong as its weakest link" had to be borne in mind, so that the overall strength had to be uniform from the lowest coupling of the harness to the top of the parachute itself.

In the Irvin service type, which, as previously mentioned, is standardised in the R.A.F., the parachute is 24 feet in diameter, the fabric used being the finest Japanese silk. This is attached to the harness by "shroud lines" of silk cord which has the extraordinarily high tensile strength of 400 lbs. These lines are continuous from the point of fixing on one side of the harness to the other and they pass through and over the top of the parachute, without any knots or splicing. The harness is made of specially woven linen webbing and is attached round the shoulder, body and legs of the wearer in such a manner that no bodily injury results when the 'chute opens at a high speed. The harness webbing has a tensile strength of 3,000 lbs., and is reinforced at all metal parts.



Attached to the apex of the main 'chute is a pilot 'chute of 30 inches diameter, which, actuated by a spring-loaded frame, leads the main 'chute out into the line of flight as soon as it is released from the pack. While not essential, this pilot 'chute has been proved to be valuable in reducing the time required for the complete opening of the main 'chute. The average time required for opening and to assume normal descent, by the way, is but one and three-fifths seconds after the pull-ring has been pulled.

Probably the most ingenious part of the Irvin is the pack or container, wherein is housed the whole of the body of the 'chute and its shroud lines. This is made of special fabric and so constructed that the instant the pull-ring is actuated the pack flies open and allows the 'chute to free itself immediately, led by the pilot chute. One may best describe the pack, perhaps, as a parcel, with four flaps meeting centrally on one face and held together by locking cones passing through grommets. Located through these cones is the rip-cord locking-pin, which is attached to the pull-ring by a cable.

Fixed externally to each flap are elastic strips which fling the flaps open the instant the rip-cord pin is pulled from the cones.

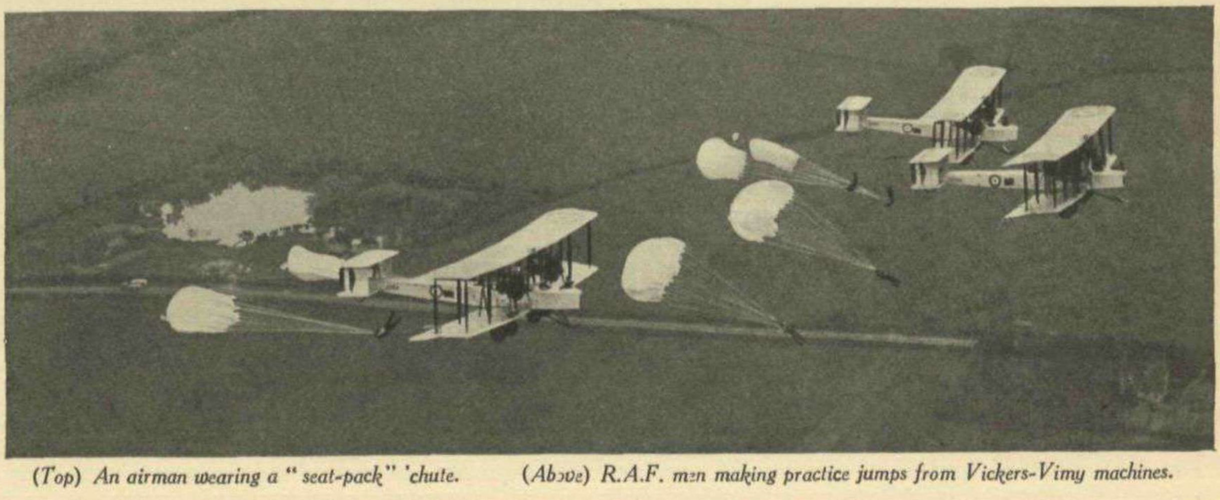
Needless to say the packing of the parachute in the container is of the utmost importance and the interior of the latter is so arranged that fouling or entangling is impossible. The shroud lines are led through pockets in zig-zag formation so that on the 'chute being released they flow out easily and evenly and the silk body of the main 'chute is folded and so positioned as to be clear of the pilot 'chute and other parts.

In manufacture, every detail and every piece of material is subjected to the strictest scrutiny and constant test both by the makers and the Aeronautical Inspection Department of the Air Ministry and every parachute issued to the R.A.F. is subjected to two gruelling "dummy" tests, before final acceptance.

The usual type of 'chute in use at the present time is the "seat-pack", which as its name implies is arranged so that the wearer sits on it when in the cockpit of a plane. There is also the "lap-pack," which has been developed for the use of aerial photographers and observers and the "back-pack," for use on lighter-than-air-craft which permits complete freedom of movement for walking about.

The standard Irvin 'chute weighs 18 lbs. and its rate of descent is 16 feet per second. In all something over 15,000 "live" drops have been made without failure, the heights from which they were attempted varying from 20,000 feet to a mere 150 feet.

G. G. O. M.



(Top) An airman wearing a "seat-pack" 'chute. *(Above) R.A.F. men making practice jumps from Vickers-Vimy machines.*

LETTERS FROM READERS.

Letters from readers on any subject are always welcome but they should be as brief as possible.

HAVING made my first acquaintance with " MOTOR SPORT " at your stand at the Motor Cycle Show, I was very pleased to find at last a paper dealing essentially with racing and other kinds of motor sport.

I have wished for such a paper for some time and your paper seems to fill the want admirably.

H.C.H.

I expect the majority of your readers are interested chiefly in the bigger types of sports cars, but as an enthusiastic three-wheeler owner I am writing to suggest that occasional articles dealing with this class of vehicle and cyclecars in general would be very welcome to many of us. I have owned a varied assortment of motors during the past six years, ranging from two-stroke motor cycles to a 38-90 h.p. car.

My latest purchase is a very fruity three-wheeler of a famous make and I must say that I get more " kick " out of driving it than I have ever done with any of my other vehicles.

" TRIPLETRACK."

WHAT is the matter with our motor cycle manufacturess ? I visited the Motor Cycle Show in order to select a machine which I might use both as a means of transport, for business purposes and for pleasure and I failed utterly to find a single machine to my liking. Of course, there were plenty of fast-looking models, with an abundance of plating and sparkling finish—very handsome indeed—and I have no doubt that their general performances are excellent. But what dismayed and disgusted me was the fact that, practically without exception, no serious attempt appears to have been made to protect the rider from mud and wet.

On many types the front mudguard design was perfectly ridiculous, and in use must be far less effective than some designs of 1919 (when, as a matter of fact, I last rode a motor cycle). Surely it is possible to have a sports machine which is at the same time reasonably clean to ride ?

It seems to me manufacturers have not made the slightest attempt to improve the mudguarding of machines. They simply concentrate on appearance and M.P.H.

H.G.

I feel that I would like to express my pleasure in knowing that " MOTOR SPORT " is now to be published again. I am sure that we shall now have a motor paper wherein all views will be freely expressed, and no feeling of antagonism will be entertained towards readers of " MOTOR SPORT " who may favour foreign cars, as such is the case with some other publications now being issued.

I am sure that all English car owners will be with me in welcoming " MOTOR SPORT," as I am sure that a great number are equally interested in cars of foreign manufacture as well as British, even though they may have patriotic feelings towards buying British, which is as it should be with all of us.

Trusting that you will allow me in the future to express myself again in your columns, and wishing you every success.

E.J.P.C.K.

LONDON AIR PARK DEVELOPMENTS.

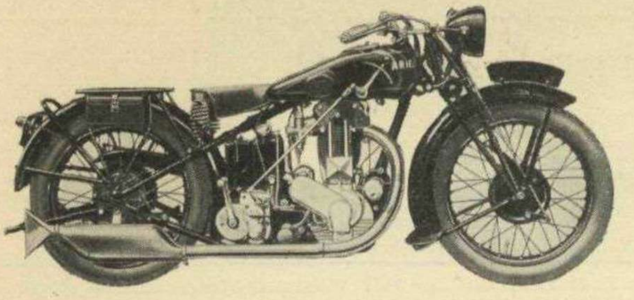
THE facilities for private aircraft owners at the London Air Park, Hanworth, have now been extended to include lock-up hangars, a regular service of inspection and maintenance, workshops for overhaul and repairs, demonstrations of new and second-hand aircraft.

The main essentials for the average aeroplane owner are the hire of a lock-up hangar and a maintenance service affording regular and thorough inspection of his machine by a qualified ground engineer, regular cleaning and refuelling, and prompt attention to orders. His needs are satisfied at Hanworth by a lock-up hangar large enough to take a folded Moth, at a rental of £3 15s. a month, and a maintenance service, known as " Schedule B," at a charge of £1 a week. This payment covers the all-important routine inspection at regular intervals, all necessary minor adjustments, and regular cleaning, lubricating and refuelling. Any additional work desired can be ordered separately at a standard tariff price.

For the aircraft owner who uses his machine frequently and requires the most thorough and comprehensive maintenance service obtainable, which leaves nothing to his own personal attention, a complete maintenance scheme known as " Schedule A," is available at a charge of £3 a week.

The organisation at Hanworth is now separated into three divisions, one for instructional and club flying, one for taxi and commercial flying and the other for aeroplane sales and service. Each division has its own hangar and staff and operates independently of the others, under the general management of the Senior Pilot.

A WINTER TEST OF THE 497 c.c. ARIEL



SPECIFICATION.

ENGINE: 81.8 mm. × 95 mm. (497 c.c.) Ariel single-cylinder, with overhead valves and enclosed rockers and push-rods.

TRANSMISSION: Chain; ½in. 0.305in. front. ⅝in. × ⅜in. rear.

LUBRICATION: Ariel dry sump system with pressure feed to the big end.

GEAR BOX: Burman three-speed. Ratios: 4.75, 7.6 and 13 to 1.

CARBURETTER: Amal two-lever with twist-grip throttle control.

BRAKES: Internal expanding, 7in. front and rear.

TYRES: 26in. × 3.25in.

WEIGHT (in touring trim): 370 lb.

PRICE (with lighting equipment, electric horn and speedometer): £59 17s. 6d.

MAKER: Ariel Works, Ltd., Selly Oak, Birmingham.

THE winter is not the pleasantest time of year in which to motorcycle but it has an advantage for anyone carrying out a road test in that the good and poor qualities of a machine are more easily revealed when climatic conditions are bad.

If a machine has a tendency to slide, if it is given to mud slinging, or is obstinate to start, the rain, mud and low temperature, such as we have had to endure during the past few weeks, will soon show up these traits. On the other hand any marked improvement above the average in regard to steadiness, comfort and cleanliness is at once noticeable.

That is why we rather welcomed the recent meteorological " mixed grill " while carrying out a road test of the 497 c.c. O.H.V. Ariel combination.

In appearance the Ariel is a solid job and its performance and " feel " thoroughly confirm this impression. Frame, engine, gear box and general fittings all have that quality of robustness which make a *tout ensemble* capable of standing up to the toughest of collar work and roughest going and in spite of the very moderate price of the machine one finds evidence of the desire on the part of the designer to incorporate modern ideas throughout.

Take, for example, the engine. The overhead valve gear which is carried on particularly substantial supports is lubricated by grease gun through extra large nipples. And the push rods and tappets are all enclosed—a feature which contributes to an absence of clatter as well as helping to prolong the life of these highly-stressed parts. The oiling system is of the dry sump type, the reservoir being situated on the saddle tube and a commendable point is the neat arrangement of the supply and return pipes connecting the pump and tank; a minimum of bends and the accessibility of the union nuts at once find favour with the practical rider. The oil gauge is situated neatly in the top of the tank.

Another good point is the ribbing of the lower half of the crankcase, which in conjunction with the careful design of the cooling fins of the cylinder, undoubtedly contribute to the markedly cool running of the engine under all conditions. An excellent tick-over is another characteristic of the power unit which together with the smooth and lightly-operated clutch, was much appreciated by us during the several days spent in riding in London traffic.

Out on the open road we found the Ariel outfit capable of a maximum speed which would satisfy all normal demands and on long runs the riding position was found to be restful and allowed of easy control without strain. It was in rough going, however, that the machine impressed us most. Over contours and surfaces of the Camberley calibre, the engine slogged away apparently revelling in its task and the stability and robustness of the whole machine was most reassuring.

In regard to criticism, we found little with which we could find fault. The brakes were excellent, starting was good and mudguards somewhat above the average. One feature on the machine which should be modified, we think, is the fish-tail of the silencers. As now arranged, the rider is liable to jab his legs against them when lifting the machine on to the stand, with painful results. Then in connection with the sidecar, while this was quite comfortable and roomy, we found the door rather awkward to open and close. A general stiffening up of the near-side panel would seem necessary. Otherwise we found the Ariel a very sound, and pleasant motorcycle.

THE SPORT AFLOAT

The Outboard Outlook

By J. W. SHILLAN

I AM often asked by people who have witnessed a motor boat race meeting whether it is a dangerous sport, and my reply is most emphatically in the negative. I believe that, in the last four years at least, three thousand five hundred outboard races must have been staged in America, whereas at least two thousand five hundred must have been held in other parts of the world of which possibly ten per cent. were held in the British Isles. In spite of this enormous total, I have never yet heard of a single fatality, neither have I heard of half a dozen serious accidents, although at most race meetings several of the competitors capsize and are thrown in the water.

Now, I maintain, there is no sport existing to-day which has the same thrill and is so safe as outboard motor boating. I have travelled round Brooklands in racing cars at over 100 miles an hour, and I have piloted outboard motor hulls at 40 miles per hour, and I know from personal experience that for a real thrill motoring on Brooklands cannot in any way compare with piloting an outboard motor boat.

The sensation of skimming along on the top of the water with the hum of a four-cylinder two-stroke motor revving at over 5.000 r.p.m. must be experienced to be believed. In an outboard boat one is virtually sitting on the water because the sides of the average hydroplane are only a few inches deep, possibly on an average 12 inches—whilst the beam of the boat, if it is of average length, is about 4ft., and so the sensation when lying in this small craft travelling at a speed of about 40 miles per hour is that of tearing along the top of the water on a board. Then again, the turns. How skilful one can become at taking the turns at high speed and what a sensation one derives when there are other outboard hydroplanes racing alongside, possibly within a couple of feet of one's own boat! I have conversed with a number of motor racing enthusiasts who have taken up outboard motor boating, and they invariably have agreed with me that the fascination of this new sport is not to be denied, whilst the cost of it is infinitesimal compared with the cost of motor racing.

For 100 guineas to-day one can buy a complete outfit capable of 40 miles per hour, and after racing it for a season, the owner should have little difficulty in getting £60 for it, providing, of course, it has reasonably been taken care of. I do not know of any large inboard racing hulls that have a speed of 40 miles per hour which can be purchased under £750, and even at that there is nothing like the thrill in piloting an inboard hull that there is in piloting an outboard hull.

The progress in design and performance of outboard motors that has taken place during the last few years is nothing short of phenomenal. It is only five years ago since I won my first outboard race on the River Thames at Mortlake at the modest speed of 5 miles per hour, whereas during the past season I won the River Shannon Championship at Athlone at a speed of 41.58 miles per hour.

The motor with which I won the race at Mortlake was developing 1.400 r.p.m. and it only achieved this at the expense of taking out the silencer, whilst the motor with which I won the River Shannon Championship was developing 5.300 r.p.m. and was fitted with an efficient standard silencer.

Whilst I was in America a month ago I visited the Elto factory and there tried out a motor which at a secret test achieved a speed of over 50 miles per hour. When I took it out for test, this motor was equipped with an underwater exhaust which I was informed causes a reduction of less than 2% in the r.p.m. as compared with the open exhaust. Furthermore, this outboard motor was equipped with a simple yet effective electric self starter, the details of which I am not permitted to divulge, as this would be a breach of confidence. This engine, however, will actually be on the market for the public to buy next March, in fact it will be exhibited at the New York Motor Boat Show which is taking place during the latter end of January.

THE OUTBOARD OUTLOOK—continued.

Now, when one considers that the Outboard Motor of five years ago was just a crude, noisy, inefficient unit, compared with the modern Outboard motor, I think you will agree that the designers of these unique marine units have been far from apathetic.

What of future developments in Outboard Motors? I look forward to a mile a minute being accomplished before the end of the season of 1932. With the increase of power which is being built into Outboard Motors, we have changes in design taking place in the hull. It is now realised that with each different class of Outboard Motor a different type of hull must be used. For instance, it is no use putting an "A" class motor which has a capacity up to 250 c.c. on a "D" class hull which weighs approximately 180 lbs., neither is it any good putting a "D" class motor having a capacity up to 750 c.c. on an "A" class hull, which weighs approximately 100 lbs. If an "A" class motor was used on a "D" class hull, there would not be sufficient power in the motor to lift the boat to a point where it would plane on the surface. It would act similarly to the displacement boat and show a speed of anything from 3 to 6 miles per hour. On the other hand, by putting a "D" class motor on to an "A" class hull, the result would be that owing to the enormous power from the motor, the boat when meeting a ripple on the surface of the water would shoot through the air, and if the force of the motor did not tear the transom from the boat, the impact of striking the water on such a frail craft at such a high speed would probably knock a plank up, and if the pilot moved his weight too suddenly through that impact, the whole outfit would at once capsize. It would certainly be an impossibility to take such a complete outfit out and race, because in a race one has to negotiate the wake and wash left behind by the other craft which happen to be ahead of one. It is therefore essential to obtain satisfactory results to use engine and hull of the same class.

290 VAMPIRE

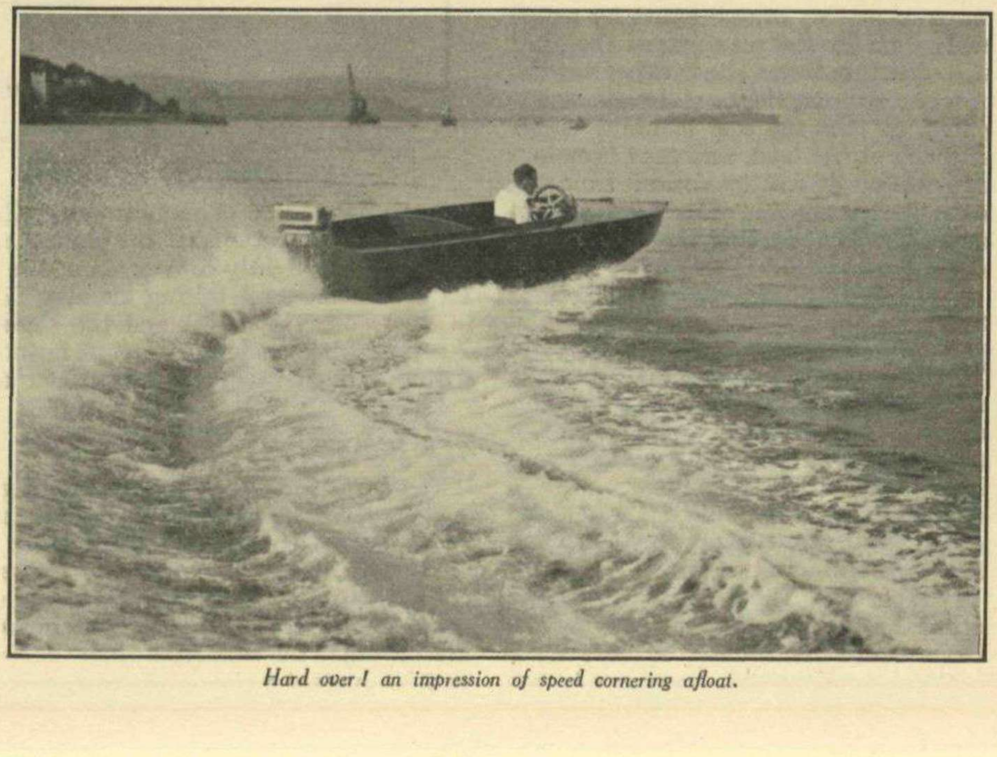
J. W. Shillan in the craft with which he won the River Shannon Outboard Championship for 1929.

The 1930 Outboard Racing Rules which have just reached me from America now stipulate minimum weights for the hulls, which include the steering wheel and motor control. They are as follows :—

Class "A"	100 lbs.
,, "B" & "C"	150 lbs.
,, "D"	190 lbs.

The reason why the "B" and "C" classes have the same weight of boat is that the "B" class motor of to-day is practically as fast as the "C" class, although I have reason to believe that the 1930 "C" class motor will be much faster than in 1929, whereas the "B" class motors will show but very little difference in speed. The result of this will be that it may be necessary to raise the minimum weight of "C" class hulls to 175 lbs.

Outboard Racing in Europe has no such restrictions as yet, but I foresee it may be necessary to do something of this kind in the near future.



Hard over! an impression of speed cornering afloat.

SPEED BOAT DESIGN

III. Construction of the Hull—A Suggested Design.

By R. R. POOLE, B.Sc.

THE construction of speed boat hulls of the 1½-litre class is generally rather beyond the capabilities of the amateur, unless special facilities are available, but the smaller hulls, such as are required for outboard engines and inboards of the nominal 7 or 8 h.p. class, offer no special difficulties, nor do they necessarily involve excessive expense. It may therefore be useful to readers to discuss some of the general features of the construction of a hull suitable for either of the last mentioned motors.

The type of hull giving by far the best performance, for a seaworthy boat, is the single step V-bottomed vessel having an overall length of about 12 to 14 feet and a beam of at least 4 or even 5 feet. The after section is quite flat bottomed as a rule, though a very slight concavity may be introduced by arching the transverse bottom ribs to a rise of about an inch at the centre. In the forward section a sharp entry is carried by a smooth flare to the flat, square edge of the step. The height of the step is not important in itself, but a rise of 6 inches will give a good angle of incidence of the after body, assuming the latter to be about 6 feet long and the boat to be planing level.

"Chassis" Construction.

The shape of this hull does not lend itself to construction on classical lines, building up from a central keel, so a modified design (Fig. 1) is based on the use of two longitudinal spars or longerons, braced apart by transverse ribs and made rigid by the planking of the after bottom. This rigid structure forms the backbone of the boat, and it can carry nearly all the bending and shearing faces at the step, so that the side planking is not required to stand much of the load, and may therefore be lightened considerably. It will be noticed from the outline sketch in Fig. 1, that the line of the after bottom is continued straight forward, meeting the bow just at the top of the cutwater.

The longerons can be carried to a point here and rigidly joined up with quarter-inch 5-ply gusset plates (see Fig. 1C.). The longerons themselves may be made of selected spruce about 3 x 1¼in. with the greater dimension vertical, and 3 or 4 main transverse ribs of similar wood, say ¾in. thick, attached to the longerons by triangular plywood gussets, and possibly reinforced in the corners with lengths of aluminium angle, screwed on. Brass screws of about No. 8 size should be used throughout, and no dovetailing or mortising should be done to any part of the chassis. The ribs may be spindled down a little, for the sake of lightness but the saving of a few ounces is scarcely worth the trouble. A more useful saving would be the tapering of the longerons to say 1½ x 1in. at the ends. The whole chassis can be sprung into shape without steaming as the curves are not too sharp for the thickness of the wood. Light side ribs of mahogany or ash can be attached to the longerons by means of small clips made of about 18 gauge aluminium sheet cut and bent as in Fig. 2. The sides may be about a foot deep behind the step, and can be made from a single piece of quarter inch mahogany planking. Struts of ½in. 20 gauge steel tubing with the ends hammered flat and bent to 45° may be set up from the main bottom ribs to support the gunwale and stiffen the sides. The gunwale need only be quite a light strip, say 1 x 1in., also of spruce or mahogany. Its side elevation will be practically a straight line. If the sides are suitably strutted the decking and upper fairing may be made extremely light. A skin of $\frac{1}{16}$in. aircraft plywood on a slender mahogany skeleton will be found easy to build, and the flat profile of the gunwale will avoid difficulty with the intersections of the fairing surfaces. If the deck is made slightly convex about the axis of the boat, a raised "blister" fairing running down the middle, to cowl both the driver and the engine, can be fitted easily, making the joints, aircraft fashion, with glued-on strips of linen tape, well varnished over.

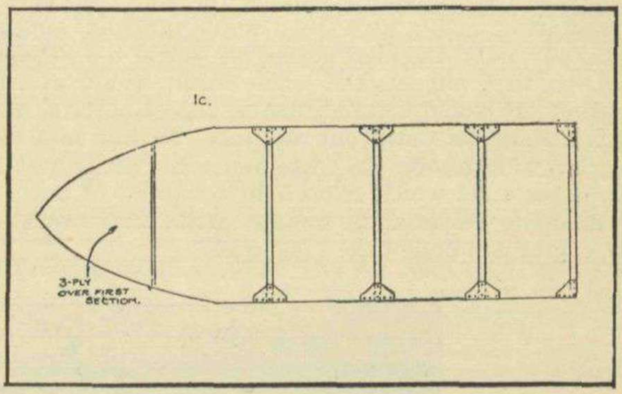


FIG. 1c.

The Bottom.

The part of the boat presenting the greatest difficulty is the curved bottom of the forward section. Bearing in mind the desiderata mentioned in the first article on design, namely a sharp vertical edge of entry or cutwater with a small dihedral angle, combined with a small angle of incidence of the immersed planes, we must arrange the transition from the former to the latter with as gradual a change of curvature as possible. This

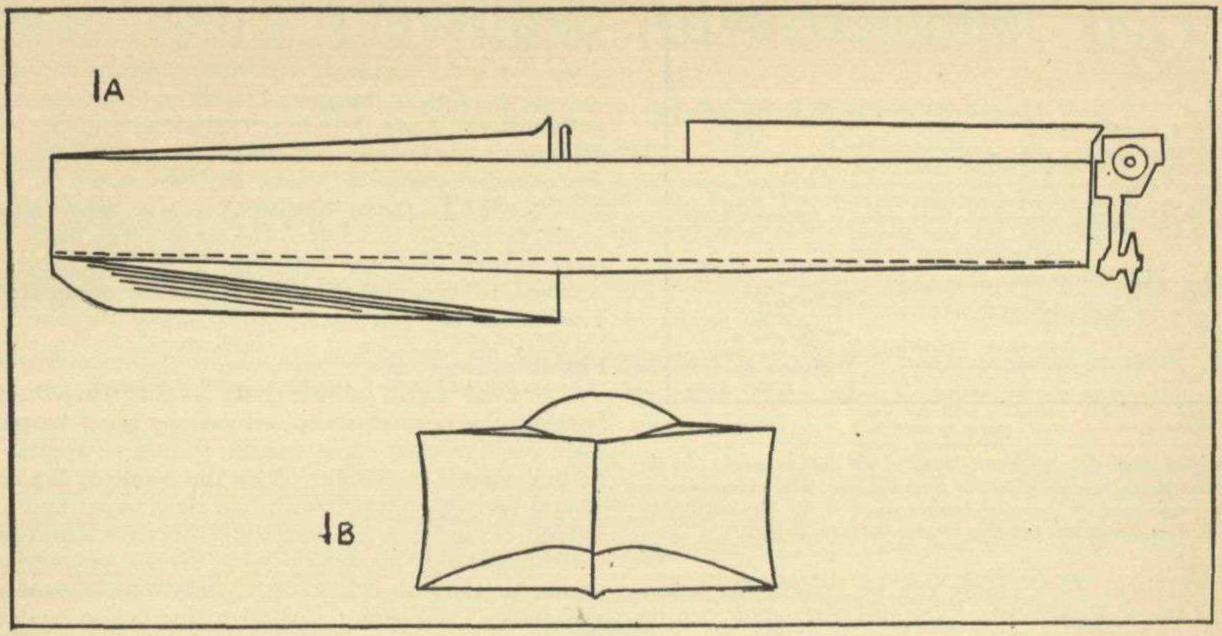


FIG. 1.

problem, of having a vertical edge at the bow, swept back to a horizontal edge at the step, presents certain mechanical difficulties. A simple experiment in folding a sheet of paper, will show that it is impossible to obtain a normal "ship-form" or convex paraboloidal curve using only a single direction of curvature, such as could be obtained by twisting or bending a flat sheet. It is possible however to obtain a good shape, involving concave cycloidal curves in the plan, by using single sheets for each side, and avoiding the difficult business of planking the curve with narrow fitted strips. The concave form is, in the opinion of the writer, a more efficient plan than the more normal style, as the acceleration of the streamlines is almost constant, instead of reaching a high maximum about a foot from the point of entry.

The shape of the panels can best be found by making a paper or cardboard model, somewhat on the lines of Fig. 3, which is more or less self explanatory. In order to obtain the necessary straight and horizontal keel line in a design which incorporates no actual keel member, the model should be set up on a vertical median plane on which the profile of the keel is sketched. The shape of the transverse sections is best found from the model, as a graphical construction is very involved, and the actual frame sections should be made carefully from about ½ in. mahogany. They should be cut to fit between the longerons to serve as ribs, and might be reinforced along the top edge with a strip of wood screwed and glued to one side to take the compression of the longerons. The plywood gussets might be enlarged, possibly even to the extent of covering over the first few feet inside the bows completely with plywood, forming a sort of false bottom.

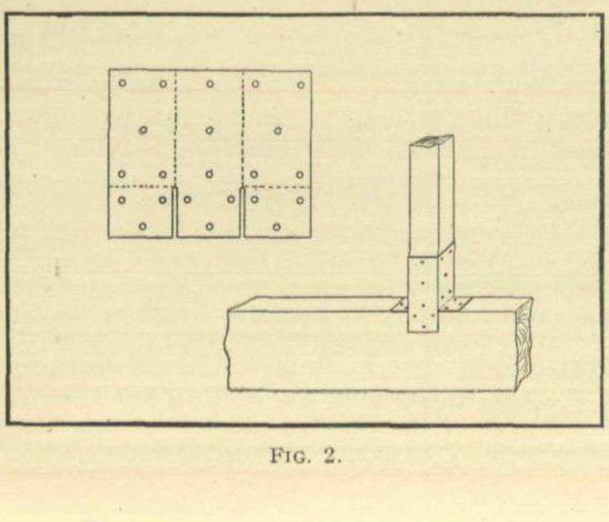


FIG. 2.

The bottom panels may be made of 3-ply of high quality about $\frac{3}{16}$ inch thick, which, if thoroughly waterproofed inside and out, with many coats of varnish, is fairly serviceable. Aluminium panels are perhaps the most easily adapted to this type of construction, since a better shape can be obtained by making the flare of the bow quite sharp, and this also brings the angles of incidence lower. It is impossible to make a jointless bottom of one sheet as the flare necessitates a slightly concave edge to each half along the centre line for covered joining up. In either case, the joint should be capped with a strip of aluminium about 2 inches wide folded so as to fit along the keel line, where it is rivetted, after doping the join with red lead. The strip should be bevelled down along its edge and the rivets countersunk and filed flush, to reduce resistance.

Engine Mounting.

An inboard engine needs very strong bearers, and if mounted in the forward compartment, these can be attached to the longerons via extra cross members. Lengths of an old car chassis make very good bearer members and can easily be attached lengthwise to the cross members and the motor bolted between them.

SPEED BOAT DESIGN—continued.

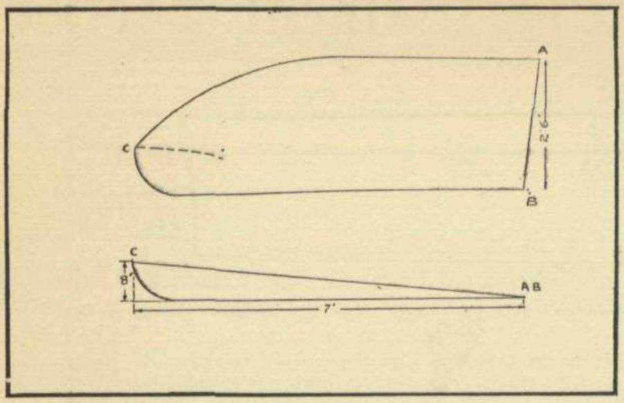


FIG. 3.

The upper figure shows the approximate shape of the bottom panel. In the model the sheet should be glued along the feathered edge to the corresponding part of the profile and the rear edge brought round to the horizontal AB. The arc AC. viewed from side will then be approximately straight.

An old Morris or Ford frame can be bought for a few shillings from a car breaker. The propeller shaft can be brought out well up in the step, so that the gland is high and dry when the boat is planing. Anyone who has tried to " stuff " an immersed gland will appreciate the advantage of not even wanting a watertight fit. If an outboard engine is used, an important requirement is a stout transom designed to take not only the forward thrust of the drive, but to withstand the forces tending to wrench the engine off when the rudder is applied. Some such system of struts as that shown in Fig. 4, would serve to strengthen the transom and in addition give a triangular bracing to the stern of the boat. Three quarter inch 16-gauge steel tube with the flattened ends screwed to the chassis should provide adequate reinforcement.

Finish.

The final finish of the hull is very important, as friction can be materially reduced by good varnishing. Thin coats of clear copal varnish should be applied until no unevenness is visible. Then the whole of the bottom should be rubbed down with fine glass paper and a little linseed oil until a fine surface is obtained, and two or three finishing coats applied. Shellac varnishes are useless as they absorb water rapidly and become rough and milky. Polishing with furniture polish renders the surface quite waterproof, and is often recommended as a means of improving the slip.

BRITISH POWER BOATS AT THE SALON NAUTIQUE

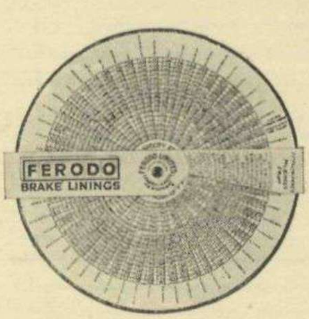
ONE of the most interesting sets of exhibits at the IVth Salon Nautique Internationale held at the Grand Palais, Paris, December 11th-12th, was that arranged by Pass and Joyce, Ltd., of London, on stand No. 5, whereon were shown the products of the British Power Boat Co., designers and constructors of the famous " Miss England " with which Major Sir Henry Segrave won the World's Motor Boat championship at Miami, U.S.A., and the championship of Germany at Templinessee. These boats are being exhibited in France for the first time, an especially interesting fact, as they are foremost in England, and just now the Power Boat is beginning to win the popularity in France that it has earned to such a degree elsewhere.

Three very fine models of power boats have been chosen to exhibit on the stand. There is a 23ft. Junior Express Cabin Cruiser with Morris 6-cyl. 100 b.h.p. engine, which can carry nine passengers and has room for two to sleep, and costs £1,125. Then there is a 23ft. Stock Power Boat of the kind that wins nearly all the races in its class at English regattas. This is sold at £685. A 16ft. " Puppydog " R.M.Y.C. Hydroplane costing £350, also attains 30 miles an hour and carries three passengers.

The British Power Boat range also includes an International 5½-litre Class Sportsman's Hydroplane model and a 13ft. Utility Outboard Speed Hull, prices £850 and £46 respectively. These prices are for delivery at the Company's harbour at Hythe, Southampton.

Full particulars of these craft may be obtained from the World Sales Distributors, Pass and Joyce, Ltd. 24-27, Orchard Street, London, W.1.

How Far To— ?



FERODO, LTD., the well-known manufacturers of brake and clutch linings, have sent us a neat little mileage calculator. With it one is able to find in a few minutes the approximate mileage from London, Glasgow, Manchester, Liverpool, Birmingham, York, Portsmouth and other main centres to some fifty odd towns in England, Scotland and Wales. Made of stout cardboard, it is a thoroughly useful gadget and may be obtained from Ferodo, Ltd., Chapel-en-le-Frith.

Due to a misunderstanding during Mr. Shillan's absence in America, the article contributed by him for our November issue, was one that had already appeared in the " Motor Boat." An exclusive article by the same writer will be found on pages 42 and 43 of this issue.

In the advertisement of the H.E. in our December issue the price of the 16/60 sports 4-seater was stated as being £545. This should of course have been £695.

Motor Sport Classified Advertisement Section

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USED SPORTS CARS.

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ALFA-ROMEO, 1500 c.c. Supercharged Sports 2-seater, 110 m.p.h. guarantee. Run under 5,000 miles. Coast £1,275. Our price £650. Cyril E. Bennett & Co., 363, Bromley Road, Catford, S.E.6. Lee Green 4444.

1929 Alfa Romeo 22-90 h.p. Special Sports, fitted with exceptionally handsome 4-door Weymann saloon, 2 spare wheels, chromium plating, Triplex glass, very fast and in perfect condition; cost £1,050, bargain £495; this car carries our written guarantee.—Bertram Alvarez and Engall, Ltd., 8, Woodstock Street (New Bond St.), W.1. Tel.: Mayfair 3213-4.

ROAD or Track, special racing Alfa Romeo 2-seater, capable of attaining a speed of approximately 115 m.p.h., fitted with dynamo lighting, quickly detachable wings and running boards, only done few miles since complete overhaul; 350 guineas. —Modern Cars, Ltd., 196-8, Great Portland St., W.1. Museum 2947 and 8. Part exchanges, deferred terms; from £10 per month.

SPECIAL 10 Days' Offer, 7½% off for cash.—Mr. *Phillip Turner offers his 1½-litre* supercharged 2-seater sports Alfa-Romeo, in almost new condition, delivered new late this year, a special competition car; cost with extras over £1,200, £895, or offer.—Thorns, 19-21, Great Portland St., W.1. Langham 3966.

ALVIS

1929 Alvis Front Wheel Drive Supercharged 4-seater, small mileage; £345.—Beasley's 374, Euston Road. Museum 7600.

1929 Alvis Front Wheel Drive Supercharged 4-seater, small mileage; £345.—Bealsey's 374, Euston Road. Museum 7600.

BUGATTI

BUGATTI, 1925 de luxe sports 4-seater, in superb condition, exceptionally fast, starter, £55; exchange, deferred; really guaranteed in writing 12 months by Delofords, 550, Oxford Street, next Marble Arch Tube.

BUGATTI, late 1926, 11.9. This car has been owned by a well-known driver and is as new; complete with cycle-type mudguards, hood, screen, etc., very smart car, £150; exchanges or easy terms. Cummings, 101, Fulham Road, London, S.W.3.

FIAT

FIAT 9, 1927, special speed model, sports 2-seater, boat body, wire wheels, condition as new throughout, one of the smartest sports cars on the road, £85, or exchange Morgan or Austin. 339a, Goldhawk Road, W.6. Riverside 5113.

HUMBER

RACING T.T. HUMBER 3½ litres. Won a race on August Bank Holiday 1929. Perfect condition with numerous spares. Will lap Brooklands at 94 m.p.h. Could be used on the road. £100 or near offer. Erskine's Garage, Brookwood, Surrey.

LEA-FRANCIS

LEA-FRANCIS (1926), 12-40 h.p. sports 4-seater. Maroon. Engine in perfect running order. Bargain, £70. Box C49.

LEA FRANCIS, February, 1929, Hyper Sports Supercharged, fitted with low sporting four-door fabric saloon body, two spare wheels, colour light blue, taxed to end of year. Sacrifice £350. London Lagonda Service Depot, 195, Hammersmith Road, W.6. Riverside 3342.

HAVE YOU A USED SPORTS CAR, MOTOR CYCLE, BOAT OR 'PLANE FOR SALE?

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LEA-FRANCIS 1929. Hyper supercharged, 2-seater. Equal to new. £315. Below.
Lea-Francis, 1927, 12-40 h.p. sports 4-seater, overhauled and repainted black and cream, perfect condition, £110; convenient deferred terms. Cyril E. Bennett and Co., 363, Bromley Road, Catford, S.E.6. Lea Green 4444.

MORGANS

MORGANS. 1929 Aero, o.h.v. J.A.P., dynamo, hood taxed, perfect, £85. Below.
1927 Aero, 10.45 h.p. o.h.v. J.A.P., dynamo lighting, just overhauled and repainted, Dunlop s.s. tyres, splendid condition, £78 10s. Below.
1928 Family, 8 h.p. J.A.P., f.w.b., in really splendid order, guaranteed, £60. Below.
1927 Family a.c. J.A.P., dynamo, perfect order, taxed, £52 10s. Below.
1923 De luxe, 10 h.p. Blackburne, good tyres, in excellent running order, £27 10s. Below.
Easy terms arranged. Homac's, 243-247 Lower Clapton Road, E.5. Telephone, Clissold 9616-7.

MORGANS. Everyone guaranteed 3 months. Below.
1929 super-sports, black and cream, as new, £120. Below.
1929 super-sports, black and orange, smart, £112. Below.
Morgan specialists, Naylor and Root, Ltd., 248-250, Lavender Hill, Clapham Junction, S.W.11. 'Phone, Battersea 6188-9. Open 9 to 8, Sundays 10 to 1 p.m.

RALLY

MACKS GARAGES, Official Rally agents offer the following 9 h.p. Rally cars fully guaranteed.
1929 Paris-Deauville Model 2 stre. "Moulin Bleu," an ideal car for trials work or high speed touring. Repainted and as new, £175.
1929 Pairs-Deauville Model "Moulin Rouge" as above. A real hot stuff 2 str. Repainted and as new, £175.
Exchanges and deferred terms arranged. 3-13, Porchester Square Mews, Bayswater. Park 9300.

RHODE & A.C.

RHODE. Overhead camshaft. Wire wheels. F.W.B. Extreme line sports body, long exhaust. Extremely fast. Price £65.

1926 AC. Six Cylinder MONTLHERY Sports 2-seater. Four-wheel brakes, wire wheels Really fast. £105. Denman's, 132-3, Long Acre, W.C. Open week-ends. Temple Bar 8135-6-7.

SALMSON

SALMSON, 1926, Special Grand Sports, twin camshaft, f.w.b., 4-speed, special, finished in Post Office red, a real speedman's car, with wonderful performances, gift, £85; exchanges, deferred payments. Humphreys, 120-2 Hampstead Rd., N.W.1. (Three minutes Tottenham Court Rd.). 'Phone, Museum 9515-6. Open Sunday mornings.

SALMSONS. Vadum Co.'s bargains include 1926¾ registration long-tail sports, f.w.b. good tyres, taxed, *innumerable accessories include* Vee screens, twin automatic wipers, special headlamps, bulb and electric horns, spotlight, etc., 49 guineas. Also 1925 Grand Prix, 49 guineas; 1925 camshaft 4-seater, 39 guineas; 1926-7 sports, 49 guineas; 1926 model Grand Prix, 59 guineas; 1927 skiff, 67 guineas; deferred terms, exchanges. Saturdays, 352 High Rd., Willesden Green, N.W.10. Willesden 2469.

SCHNEIDER

1929 13-55 sports 4-door fabric saloon, in magnificent condition throughout, unmarked, extraordinarily fast and most attractive. Below.
1929 13-55 sports 4-5-seater, also several second-hand 10 h.p. open models from £110. Schneider Automobiles, 138, Long Acre.

Motor Sport Classified Advertisement Section—*continued.*

MOTOR CYCLES.

498 c.c. A.J.S. actual 1926 T.T. machine. Engine completely rebuilt with double oil pump and pressure-fed big end. All wearing parts renewed including new racing specialloid piston in reground barrel. *3½ gallon twin tanks and sprint tank.* Spares include cylinder head, barrel, valves, complete range of engine sprockets, and 2 spare wheels. Also T.T. sidecar chassis with spare wheel. 95 m.p.h. in sprint tune, perfectly flexible on the road. £40 the lot. Box S.85. MOTOR SPORT.

85 M.P.H. Scott 1927, genuine TT. model, raced in the Isle of Man; excellent mechanical condition throughout and paint. Brand new Fort Dunlop tyres, *special cellulose finish twist grip,* £55 or near offer. Box S95.

1928 RUDGE WHITWORTH Sports Model. *Specially tuned by Works. Polished* head and ports. Fitted T.T. 3-gall. petrol and separate oil tank. Just overhauled and new big end fitted. £38. Box S.87.

1928 K.S.S. VELOCETTE. 3rd in 1929 Amateur Road Race. Reconditioned, £38. Box S.88.

1927 K.S.S. VELOCETTE, perfect mechanical condition, and paint unscratched, £36. Box S.89.

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NATIONAL Flying Services Ltd. 'Phone Gerrard 9316. Quick deliveries. New or second-hand machines.

AIRCRAFT FOR SALE.

A 28ft. span single-seated biplane, fitted with 45 h.p. 6-cylinder Anzani engine. Rafwire bracing throughout and complete, less R.P.M. and air-speed indicators. Can be seen near London. £45.

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MOTOR BOATS.

28 foot Motor Cabin Cruiser Kelvin Engine, Ketch *Rigged, full inventory, sea-going gear.* Particulars Major Henderson, Derby Haven, Isle of Man.

MISCELLANEOUS.

BINKS 2-jet Mousetrap Carburetter complete with twist grip control. New cost £5. Accept £2 10s. Box 0100.

NATIONAL PARAFFIN ENGINE, *4ft. fly wheel,* runs very steadily. Suitable for running 100-light electric lighting set or large workshop.—Box 0245.

MORRIS-COWLEY ENGINE, completely overhauled and complete with gear box, new magneto, dynamotor, etc. Ideal unit for fast inboard launch or small cruiser. Whole in first-class condition. £12.—Box 0210.

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GRAFTON hoods, re-covers, side screens, rear and dickey seat screens, tonneau covers, etc. Quotation and list free. Grafton Engineering Co., Sycamore Grove, New Malden.